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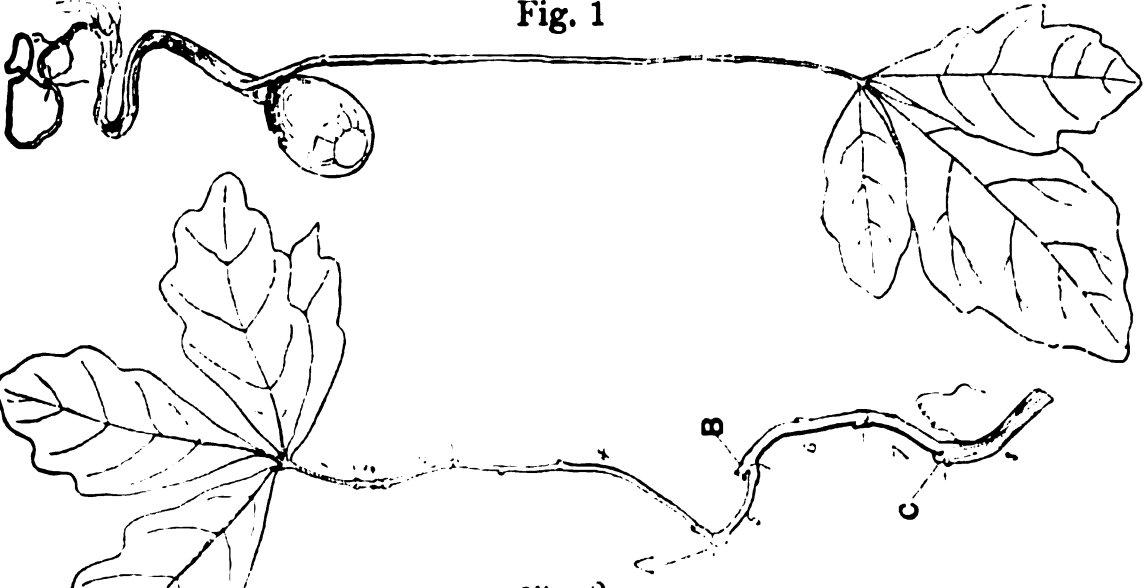

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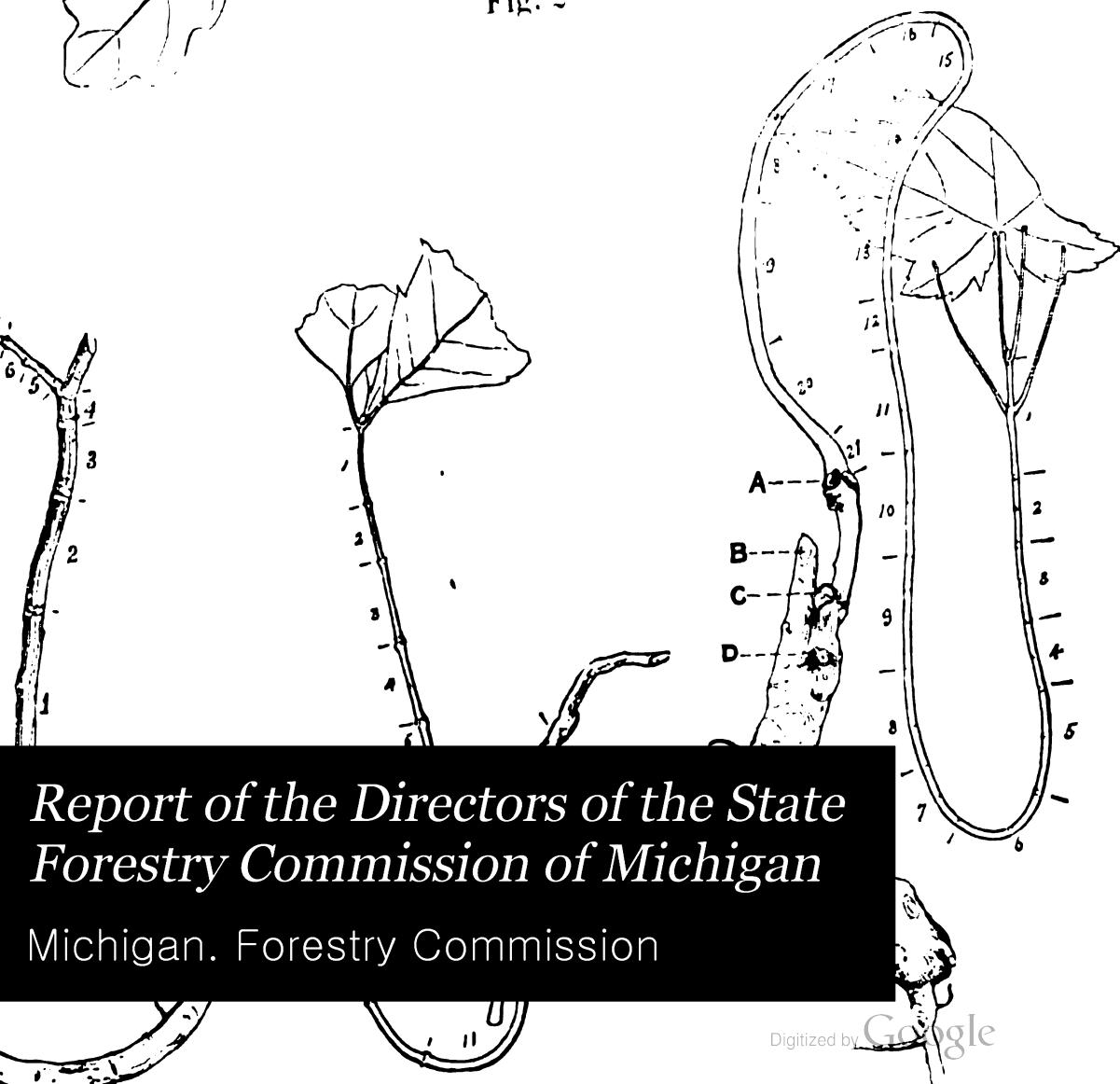

Report of the Directors of the State Forestry Commission of Michigan

Michigan. Forestry Commission

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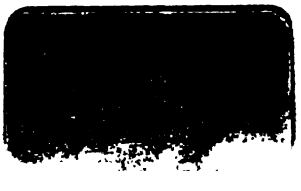

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FIRST REPORT

OF THE

DIRECTORS

OF THE

STATE FORESTRY COMMISSION

OF

MICHIGAN —

FOR THE

YEARS 1887 AND 1888.

BY AUTHORITY.

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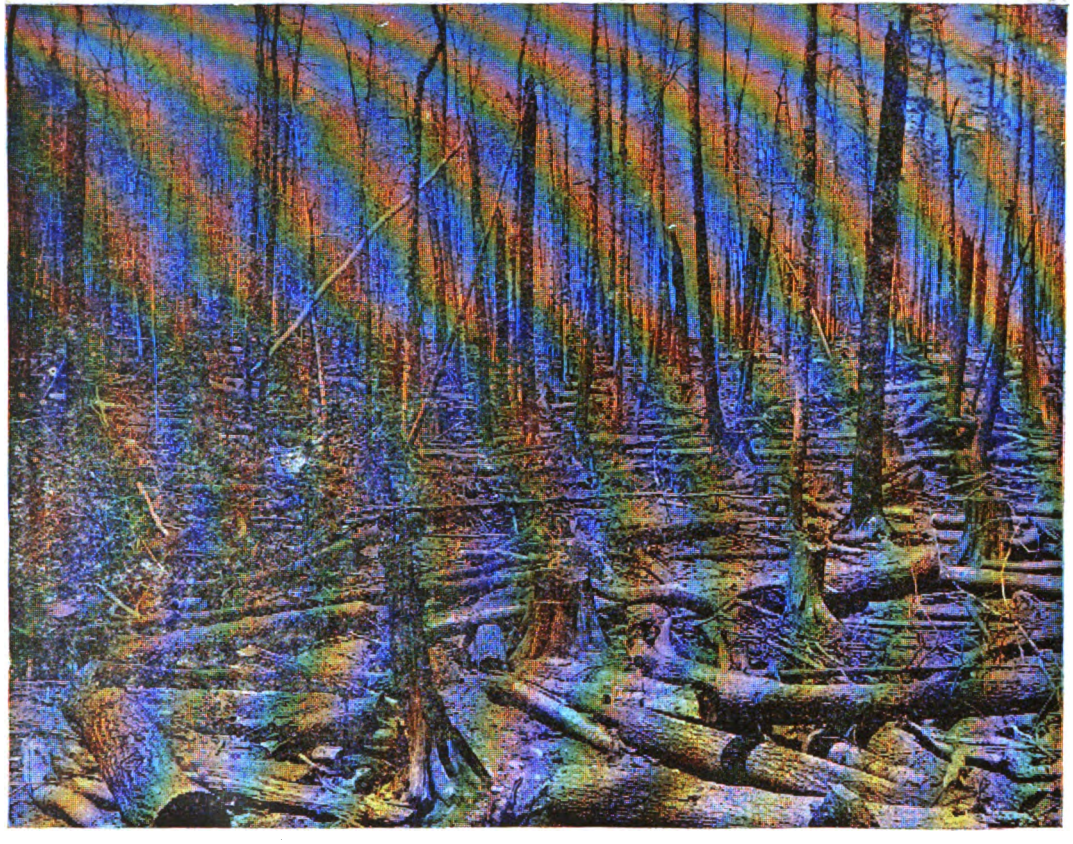

THE LUMBERMAN HAS TAKEN WHAT HE WANTED.

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REPORT OF THE DIRECTORS OF THE STATE FORESTRY COMMISSION.

AGRICULTURAL COLLEGE, MICHIGAN,
October 31, 1888.

TO CYRUS G. LUCE, *Governor of the State of Michigan:*

We have the honor to submit herewith, in compliance with legal requisition, the accompanying report of 1887-8.

Respectfully yours,

W. J. BEAL,
CHAS. W. GARFIELD,
Directors of the Michigan State Forestry Commission.

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MEMBERS OF THE STATE FORESTRY COMMISSION.

HON. FRANKLIN WELLS,		CONSTANTINE.
HON. HENRY CHAMBERLAIN,		THREE OAKS.
HON. ELIJAH W. RISING,		DAVISON STATION.
HON. GEO. B. HORTON,		FRUIT RIDGE.
HON. WM. B. MCCREERY,		FLINT.
HON. CHAS. W. GARFIELD,		GRAND RAPIDS.
HON. C. G. LUCE, GOVERNOR OF THE STATE,	*Ex-officio.*	
HON. EDWIN WILLITS, M. A., PRESIDENT OF THE STATE AGRICULTURAL COLLEGE,	*Ex-officio.*	

OFFICERS OF THE COMMISSION.

HON. FRANKLIN WELLS,	President.
HON. HENRY G. REYNOLDS,	Secretary.
HON. WM. B. MCCREERY,	Auditor.
DR. W. J. BEAL, OF AGRICULTURAL COLLEGE,	*Directors.*
HON. CHAS. W. GARFIELD, GRAND RAPIDS,	*Directors.*

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THE LAW PROVIDING FOR A STATE FORESTRY COMMISSION.

Public Acts of Michigan, 1887.—Act No. 259.

AN ACT to provide for an Independent Forestry Commission of the State of Michigan and to define its duties and powers and to provide for the expense thereof.

SECTION 1. *The People of the State of Michigan enact*, That the members of the State Board of Agriculture are hereby constituted a commission to be known as an Independent Forestry Commission.

SEC. 2. It shall be the duty of said Forestry Commission to institute an inquiry into the extent to which the forests of Michigan are being destroyed by fires, used by wasteful cutting for consumption or for the purpose of clearing lands for tillage or pasturage. Also as to the effect of the diminution of the wooded surface of the land upon ponds, rivers and water power of the State, and in disturbing and deteriorating the natural conditions of the climate. Also as to the protection of denuded regions, stump and swamp lands.

SEC. 3. Said Commission shall make report of the results of their inquiries to the Governor of the State, together with such legislation as seems to them expedient to propose to preserve and restore the forest wealth of the State, sixty days before the assembling of the legislature for the year eighteen hundred and eighty-nine, and the State printer, under the direction of said Commission, shall cause to be printed as many copies of said report for distribution as they may deem expedient.

SEC. 4. It shall be the duty of the supervisor of each township, on or before the first Monday of June, eighteen hundred and eighty-eight, to make a careful estimate of the area and condition as to the stage of growth, density and character of forest land in their several towns. Also the area and waste of barren land on which valuable forest trees might be grown, and report the same to the Forestry Commission. A consolidated summary of these returns by counties, and of the information as to the same matter otherwise gathered by said Commission, shall be included in the annual report.

SEC. 5. The supervisor of every township as aforesaid and in which a forest fire of more than one acre in extent has occurred within a year, shall report to the Forestry Commission the extent of area burned over, to the best of his information, together with the probable amount of property destroyed, specifying the value of timber, as near as may be, and amount of cord-wood, logs, bark or other forest product; also fencing, bridges and buildings that have been burned. They shall also make inquiries and report as to the cause of these fires, if they can be ascertained, and as to the measures employed and found most effective in checking their progress. A summary of these returns by counties, and of the information otherwise gathered by said Commission, shall be included in their annual report. Blanks for the reports required in this act shall be furnished by the Forestry Commission to the several townships at the expense of the State.

SEC. 6. The said Commission shall serve without compensation, but a sum not exceeding one thousand dollars is hereby appropriated to pay the necessary expenses incurred in collecting the information required by this act to be ascertained by said Commission, to be paid for by the State Treasurer, upon the warrant of the Auditor General, out of any funds not otherwise appropriated.

Approved June 27, 1887.

Under the provisions of the above law the members of the State Board of Agriculture, in response to a special call issued by Hon Franklin Wells, senior member of the Board, met in the office of the Board, at the Capitol, in Lansing, on the 26th day of October, 1887, and effected a formal organization by the election of officers and a Board of Directors, to carry on the work of the Commission.

The members and organization of the Commission will be found on pages 4 and 7 of this volume.

HENRY G. REYNOLDS,
Secretary.

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PREFATORY NOTE.

Brevity has been sought in the following report, to the exclusion of important matter germain to the work of the commission. The proceedings of the Forestry convention at Grand Rapids, of which we present but a brief abstract, are of value and may be found in the report of the Secretary of the Board of Agriculture for the current year. In the same volume, in the report of the botanist of the experiment station, there is a brief account of experiments in forestry begun on the Jack-pine plains of the State, as well as an account of the organization of a party and their trip across the State in June, for the purpose of studying the forestry and agricultural possibilities of the region traversed.

This volume is really but a small beginning of the work that Michigan might do in connection with the investigation of this great forestry question as affecting the future of our State, and the formulation of such methods and laws as will render permanently valuable the results of investigation.

It is prepared by men whose time is occupied quite fully with other duties, and should not be compared with the more elaborate treatises issued by other States at large expense, and which contain the researches of experts employed for a long time on small divisions of the general subject.

From articles that have appeared in the public press, words that have been dropped in lectures and essays, and letters that have been written the Commission, the feeling has grown upon the directors that in some quarters there is gross misapprehension of their views with regard to timber planting and removal, and they take the liberty of stating in this connection that they are not opposed to the removal of timber; they do not recommend that farmers should go to planting forests on good arable land; they do not believe that peril is imminent to Michigan as a result of the extensive elision of the forests.

On the contrary, they commend the practice of securing the best possible returns by cutting off the mature timber of our State, and have no sentiment to waste over the removal of the monarchs of the forest that are ready for the harvest.

They do deprecate wasteful methods of cutting, and feel most earnestly the desirability in Southern Michigan of planting out waste land, odd corners upon farms and borders of streams to rapidly growing trees that can be cared for at minimum expense, and will grow into valuable timber largely while men are sleeping. They do believe most emphatically in teaching children and young people a respect for growing trees, developing in them a love for the planting and growing of trees, and opening to them a knowledge of the influences of trees and forests upon the people and the modification of civilization as affected by the deforestation of a country. They do feel earnestly the desirability of spreading among the people the most reliable information about tree planting, characteristics of the most desirable kinds to plant, economical management of farm wood lots and the advantages that will accrue to the horticulturists of our State as a result of correct knowledge as to the protective advantages of timber areas to the fruit growing interests of our State. And, lastly, they are not undmindful of the tendency, as a result of forest removal, to climatic conditions that characterize treeless regions to the west of us, which would in nowise be to our advantage.

WM. J. BEAL,
CHAS. W. GARFIELD,
Directors.

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THE CONVENTION HELD AT GRAND RAPIDS.

ABSTRACT PREPARED BY C. W. G.

In pursuance of the scheme of purposes as outlined by the commission soon after its organization, and in acceptance of a cordial invitation extended by the Grand Rapids Board of Trade, a Forestry convention was held in the city of Grand Rapids on the 26th and 27th of January, 1888. This meeting was convened with the objects in view of comparing opinions, gathering facts, and recording current thoughts in our State upon questions that would naturally present themselves to the commission in pursuance of the work indicated by the law creating it.

The full proceedings of this convention have been issued as a bulletin from the Department of Forestry at the State Agricultural College, and will appear in the annual volume, compiled by the Secretary of the State Board of Agriculture for 1888.

From the minutes of the convention, the commission presents the following excerpt as properly a part of this report to the legislature.

WHY THE LAW WAS ENACTED.

Hon. N. A. Beecher, of Genesee county, recited to the convention the reasons why a bill was drawn and the law enacted which provided for the Forestry Commission in Michigan. He found a number of leading thoughtful men in the State who were discussing the best means of staying the great waste of timber in the State by fire and careless cutting, and how best to conserve the forest wealth of the northern part of the State so that it could be most wisely utilized, and how by encouraging new plantations in the southern part of the State to restore the conditions needful to the most successful agriculture, which had been swept away with the thoughtless destruction of nearly all the forest growth.

He stated as an admitted fact that where one-fourth to one-third of the total area of timber is allowed to grow, we can raise more products of all kinds than where the country is denuded of the same. The humidity of the atmosphere, six per cent. greater in forest than in field, assists in producing rain and is more healthful.

The annual waste or consumption of forest timber in one year in the United States is, according to the last census, estimated at $700,000,000, more than double the amount of the National Bank currency.

There are 1,000 mills engaged in manufacturing lumber and shingles in

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Michigan, with an invested capital of $48,000,000, and the value of the annual product approximates $60,000,000. The owners of these mills employ 35,000 persons, who receive annually an aggregate of over $7,000,000. The total product of Michigan for 1886 is almost 3,000,000,000 feet; shingles 283,838,000.

Mr. Beecher quoted Geo. S. Frost, an extensive dealer in Michigan pine lands, as saying: "The whole timbered area of Michigan is 'cornered' and will not last more than fifteen years."

The amount of timber used by railways in operation in this State for the year 1885 was 3,750,000 ties; allowing thirty-five feet to each tie, gives 131,250,000 feet. Then comes piling, bridge timbers, etc., which equal one-third of the above. In addition to this there are at least 1,500,000 railroad ties shipped from this State to other localities.

It needs no argument to prove the commercial value of pine and hard woods, but the cheaper woods, those that have been considered nearly worthless, are becoming valuable. Extensive pulp factories are springing up in different parts of the State and utilizing the cheaper woods, such as spruce, balsam, small Norway, jack pine and poplar. The demand for these species is increasing rapidly.

It was these facts, and the experience Mr. Beecher had had in growing plantations of trees that led to the enactment of the law creating a commission to open the way for such legislation and education as seemed wise in the premises.

A paper was presented by Prof. James Satterlee on

NUT BEARING TREES,

deprecating the practice of figuring out grand results from planting nut trees in quantity upon the outcome of a single specimen favorably located. He related his own experience briefly as follows:

"In an orchard in Montcalm county of one hundred chestnut, walnut and butternut trees, planted twenty-five years ago, from twenty-five to forty feet apart, on ordinary sandy loam 'oak openings' soil, the trees now average from nine to twelve inches in diameter below the branches, have handsome symmetrical heads, and are from thirty to forty feet in hight. One, a walnut, at one corner of the field, in the richest, moistest soil, has reached a diameter of fifteen inches below the branches, which spring from the trunk at about five feet from the ground. These trees were kept well cultivated for the first twelve or fifteen years, since which time they have been kept in grass, and closely pastured by sheep. The trees increase in productiveness each year, and now bear ten or fifteen dollars' worth of nuts each year.

"But counted from a money standpoint, this little orchard has been a failure. As a timber supply it would not be a success. The potatoes that were raised on an equal area of land by the side of this little orchard during the past year would buy more stovewood than the whole plantation would make to-day."

The professor, however, counted the investment a valuable one as contributory to the satisfaction resultant upon ownership of an attractive rural home.

VALUABLE TIMBER REMAINING IN MICHIGAN.

G. W. Hotchkiss, of the Chicago Lumberman's Exchange, estimates that Michigan originally had about 150,000,000,000 of feet, board measure, of

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pine, but now has only from 12,000,000,000 to 20,000,000,000. During the last five years there has been an average cut of 4,500,000,000.

Arthur Hill, of Saginaw, thought Michigan now had 30,000,000,000 standing pine.

Perry Hannah said the hard wood of northern Michigan was worth more than all the pine the State had ever produced.

E. W. Barber, of Jackson, presented some gleanings from the census:

Of the 36,755,200 acres representing the area of Michigan, but 13,807,240 acres are in farms, of which 4,452,206 acres, or thirty-two per cent are woodlands. In 1880, the percentage of woodland to total farm acreage in southern Michigan by counties was as follows:

Counties.	Per cent.
Allegan	28
Barry	29
Branch	22
Berrien	28
Calhoun	18
Clinton	25
Cass	24
Eaton	27
Genesee	28
Hillsdale	22
Ingham	25
Ionia	24
Jackson	17
Kalamazoo	17
Kent	28
Lapeer	29
Lenawee	21
Livingston	23
Macomb	22
Monroe	29
Oakland	21
Ottawa	31
St. Joseph	19
St. Clair	26
Van Buren	28
Washtenaw	18
Wayne	21

These counties, except about one-half of those in the northern tier, lie south of the forty-third degree of latitude, and it will be seen at a glance how efficiently their forests have been removed. Competent authorities state that, for the best agricultural results in a country where the average rain-fall is even more than it is in Michigan, at least one-third of the farm lands should be covered with trees; and yet, of the counties named, in some of which there was originally considerable pine, Ottawa only showed 31 per cent eight years ago: while Jackson and Kalamazoo had but 17 per cent.

UTILIZING THE BARREN KNOLLS.

L. D. Watkins, of Manchester, Michigan, advocated the planting of barren and waste places to rapid growing trees, as a matter of farm economy. He said the common locust was a rapid growing tree and there was no reason why the poor spots on farms could not be made fairly profitable by planting to trees and at the same time the earth rendered more attractive.

J. Austin Scott, of Ann Arbor, a veteran tree planter, gave valuable illustrations of the rapidity of tree growth under proper management. Trees

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that he planted in his boyhood in Connecticut and in early manhood in Ohio are now two feet in diameter. Twenty years ago he purchased a place in Ann Arbor covered with saplings, and now many of them are eighteen and twenty inches in diameter. He advocated the American elm as a tree for street planting.

Benjamin Hathaway related his experience in making and managing a farm wood lot. He set maples in 1859 in considerable quantity that are now a foot in diameter and have been utilized for five years in the manufacture of syrup and sugar. White pines set the same year have grown to the same height as the maples, but do not average quite so great a diameter. His reserve wood lot was planted with small maples—say an inch in diameter, white pine, blue and white ash, spruce, cedar and other evergreens. These trees were grown in the nursery four years along with rows of chestnut, walnut, butternut and hickory grown from the seed. These trees, when planted in the wood lot, were set 30 feet apart, and well planted, with abundant root, and well formed top. Not more than one per cent of the plantation failed. The pine and spruce have made the largest growth. He described minutely the management of an eight acre and twelve acre plantation, mentioning, incidentally, that one of these he had cultivated continuously since planting, and in it were now growing raspberries and blackberries which thrive in the shade of the trees. Mr. Hathaway described his method of planting trees along his fences and highways to be utilized for posts upon which to string wire. Wagener apple trees planted seven years ago and headed high are already large enough to support such a fence.

He strongly advocated that each farm should have a half acre devoted to growing forest trees to be used in planting where and when they were needed. Mr. Hathaway was of the opinion that from a money point of view the investment in trees on his farm had been a valuable one; that his farm to-day, if put on the market, would bear him out in the opinion.

Arthur Hill, of Saginaw, presented a paper on

FOREST FIRES—PREVENTIVE LEGISLATION.

From the U. S. census for 1880 he quoted the record of a specimen year in which 267 forest fires were reported, originating as follows:

From clearing land	161
Locomotives	43
Hunters	59
Smokers	3
Indians	1

We have stringent laws for game protection, yet our forests which shelter the animals are of far greater moment. Mr. Hill's suggestions concerning needed legislation succinctly stated are:

First. A provision making the supervisor of each township fire warden of his township and defining his powers and duties and fixing a fair rate of compensation for his services.

Second. A provision substantially the same as section 1, chapter 328, Compiled Laws, which provides that every person who shall willfully or negligently set fire to any woods, prairies, or grounds not his own property, or willfully or negligently permit any fire to pass from his own woods, prairies

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or grounds to the injury or destruction of the property of any other person shall be deemed guilty of a misdemeanor punishable with fine or imprisonments, or both, the party injured to have double damages for the injuries sustained.

Third. A prohibition against the building of fires by persons clearing land during the period from April first to November first in each year without the consent of the fire warden in writing, with previous notice to owners or occupants of adjoining lands.

Fourth. Provisions as to railroad companies, requiring them to keep their right of way clean of dead herbage and other combustible material and compelling any railroad company, upon the written request of any fire warden through whose jurisdiction its road passes, in time of danger, to burn coal instead of wood for locomotive fuel, and to employ a corps of men to be known and to act as a "fire patrol," whose special duty it shall be to prevent fires in and along the right of way and to suppress fires originating in the right of way and compelling the companies at all times to use extreme diligence in preventing and suppressing fires kindled by the companies, their agents and employés.

Upon this general subject B. E. Fernow, of Washington, D. C., presented his views. To dispel ignorance should be the first object of legislation. Hence the necessity of a careful canvass of forest resources provided for by the State, and development of the lines of manufacture which demand timber of certain kinds. The disastrous results of ruthless forest destruction in other lands ought to have its influence upon us in framing laws which should either prevent a like destruction, or create in place of that which is elided, a growth which in itself would modify the results of man's destructive work, when looking simply to immediate accumulation of property.

Mr. Fernow said that special legislation, then, which is the strong expression of the interests of the community, is needed for forests and forest property, can admit of no doubt. The forest legislated which is needed in Michigan as well as most other States, must be directed, first, to a better protection of the forest property as long as it may last, which we have from nature's kind hands; secondly, protection of the future crop, as far as nature has kindly restored it or man has planted it; thirdly, it is to provide and make accessible such information as will enable the people to utilize their forest growth to better advantage, will enable them to see the necessity for reforestation in certain places, and the desirability in others, furnish the basis of a rational system of forest management, just such as we attempt to introduce into agriculture; fourthly, legislation may go so far as to recognize a temporary need of directly encouraging a private activity in planting and caring for forest property by means of temporary financial assistance or other aids, reduction of taxes, etc.

He advocated provision for an energetic forest commissioner, charged with the forestry interests of the State in all their bearings, who would procure and digest for you the statistics, who should interest himself in seeing fire and forestry laws executed, who should furnish such information as is needed by forest planters, legislators, manufacturers, etc.

Last year $10,000,000 worth of property was destroyed by forest fires in Michigan. The State can well afford to spend at least the interest on this annual destruction of property in an attempt to curtail and control it.

With regard to encouragement of forest preservation and planting Mr. Fernow said:

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"A State law which will encourage the holding of forest areas by townships or counties, and their administration under direction of the forestry commission or commissioners, is highly desirable. There is no reason why a township or county should not own and manage a forest, when it is in the interest of the community to so own forest property, just as they own and build roads, bridges and schoolhouses, or as a city owns its municipal buildings and other property. The community is not only richer than the private man, but is longer-lived, and can more conveniently wait for returns. Let, then, where public interest should demand afforestation, the community step in and plant the forest, charging the outlay in the form of a lien or mortgage upon the growing forest, with all the rights and liabilities that usually pertain to such investments, except that the interest may accumulate until the crop is ripe and ready to be marketed, when the loan, with accumulated interest, must first be repaid before the owner reaps any benefit. Any such forest planting, now begun, will at the time when the crop becomes useful prove such a satisfactory investment that no further encouragement for careful forest management will be required by the harvester."

Dr. W. J. Beal quoted losses by forest fires from the last census as follows:

	Acres Burned.	Prop. Destroyed
California	356,800	$440,000
Colorado	113,800	935,500
Michigan	238,000	985,980
Minnesota	250,000	1,398,000
Montana	88,000	1,128,000
Pennsylvania	685,700	3,643,000
Tennessee	985,000	5,253,900
Wyoming	83,000	3,255,000

The loss by fire in the United States is about one-twelfth the value of fuel consumed, and one-seventh the value of timber cut for lumber, ties, posts and bridges. But the greatest loss is in the destruction of young growing trees, seeds, etc., which are ready to do the most of reforesting when the mature timber is removed.

Mr. H. G. Hollister, of Grand Rapids, said:

Many forest fires are set by men for the purpose of compelling the using of the lumber at once that they may get employment the following season; and, also, by persons wanting to buy a tract of land, thinking by this means to lessen the price. Now, protection from these fires means expensive supervision, but it is worth the cost.

The G. R. & I. Railway Co. have become impressed with this idea and so have put their lands in market.

In a general discussion upon forest fires, it was generally conceded that the State should take hold of the matter, and from the experience of older States which had enacted laws, draw up a plan that will at least mitigate the present enormons destruction of property from this cause.

Mr. Fernow advised in general the adoption of a combination of the Pennsylvania plan of fire wardens appointed by the county commissioners of each county and the Canadian plan, where the lumbermen and the State combine, half and half, during the dangerous season and employ a fire patrol to extinguish and warn against fires. It was optional with the Canadian lumbermen to have the system or not, and it has worked so well that it is extremely popular.

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PROFITS IN TIMBER CULTURE.

Under this title Hon. Martin Conrad, of Chicago, foreman of the largest wagon works of that city, said:

Five sorts of timber are foremost in the construction of wagons.

First. White oak (including swamp white oak), maturing for wagon work in eighty years or less.

Second. Shell-bark hickory, maturing or fit for use in thirty to fifty years.

Third. White ash, now becoming very scarce but very valuable, fit to use in thirty years.

Fourth. The tulip tree, or whitewood, superior for carriage bodies, wagon boxes, requiring sixty years or more to get fit to use.

Fifth. Red or Norway pine, requiring at least sixty years before it is profitable to cut for the bottoms of wagon boxes.

In growing trees men forget that an acre of well grown timber, artificially grown, is worth five times as much as one that has grown in a natural way.

Mr. Conrad, after studying what has been done in a limited scale, estimates that one good tree would grow to the rod, 160 to the acre, say 110 to the acre after eighty years.

We start with 2,700 to the acre, and thin them as they grow, when eighty years old each should make 500 feet of lumber, or 55,000 feet to the acre, worth in Chicago now, $1,430, and in eighty years, no doubt, it will be worth $50 per 1,000, or $2,750.

The cost of raising is much reduced by thinning, the tan bark, etc.

A man need not wait eighty years to realize money on the timber, as young timber can be sold with the land. It has a prospective value, as a pig, a colt or calf. Young timber is on the line of a permanent improvement.

Prof. Satterlee in discussing farther the subject, spoke of the growing of hoop-poles, saying that bitternut sprouts grow with surprising rapidity, making a crop once in six years of considerable profit.

The quality of timber as affected by rapidity of growth was illustrated by Mr. E. R. Lake, clerk of the forestry commission. Second growth pine of Massachusetts was very inferior to virgin forest pine of Michigan; while second growth hickory of rapid development was far superior to that of slow growth, thus making the point that slow growth in cone bearing trees is desirable, while in deciduous trees we should stimulate rapid production of wood.

Dr. Beal showed the reason for this in the growth of cells.

Dr. R. C. Kedzie of the Agricultural College gave an address, taking for his text

A WORD ABOUT WATER,

in which he gave an account of a recent journey across the continent and a resume of his impressions concerning the relationship of rainfall to the development of a region and the importance of employing every means in the power of man to secure a sufficient fall of rain to grow a full round of crops for human sustenance. He said there was a suspicion spreading widely that throughout the older parts of our country the climatic conditions which control the seasonable rainfall are so changing as to produce greater extremes of drouth and flood; that the water level in many regions is lowering; and that there is a relationship between the elision of the timber and the irregularity of the rainfall.

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Indians making sugar in Crawford county. Three young bear are playing in the foreground.

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Researches have been made abroad with reference to these questions, but he questioned if these were applicable to our own country with sufficient exactness to be of very great value. He compared the physicial geography of the eastern continents to our own, showing that there was the greatest contrasts in the characteristics which are generally conceded to modify climate.

With regard to our peninsula he remarked:

"But when we turn our attention to the position and surroundings of our peninsula, we are satisfied that nature chose this spot for some peculiar manifestation of her favors, and when she threw the arms of her encircling lakes in a loving hug about our peninsula she meant business! Looking at the unique position of our State, no thoughtful person will doubt that the meteorological conditions here demand a separate and careful study irrespective of the general climatal conditions prevailing elsewhere. No generalized discussion will meet our condition as a State. * * * What are the relations of forests to rainfall? to soil-water? to crops? to the public health? What will be the influence of deforesting in these various particulars? We can gather a large harvest of opinions, guesses, suggestions and views on all these subjects. But what do we *absolutely know about any of them?*

"In these questions about the relation of forests to climate we want *facts,* not *fancies*—facts strong as granite and changeless as the sun, so that when we build up our theory, and call it a science, we shall not have to 'lay again the foundation of repentance from dead works.' With fancies we may inflate a beautiful cloud that will soon fade into thin air, but with facts we may build a pyramid that will bide for aye. Have we now such facts on this subject? Who can tell us for certain the real difference between the air in a forest and that in an open field on a summer day?"

The address closed with the following words relating to original investigation in this State: Permit me to say that the whole subject of the relation of forests to meteorology is one of great interest, and would seem to be one of vast importance to our people. If there is a causal relation between forest area and climate, and if there is danger that we may ignorantly disturb the harmonious relation of field to forest, it is time to pause and inquire before the time of safety is overpast. It may seem that the thermometer, the psychrometer and the rain gauge are feeble intrumentalities by which to fix the line of policy of a great State, yet the fall of an apple revealed the law of gravitation and turned human thought into new channels.

"It seems that we are now in just the position to take up and investigate these questions of overshadowing importance to our people. Thanks to our far-seeing State government, we have a Forestry Commission and a State Weather Service, the very organizations to carry forward such an investigation, and, by singular good fortune, both organizations are under the direction of the same board. And Michigan is just the one to lead the van of States in this, as she has in so many other new lines of work."

A paper was presented by Eugene Davenport, of Woodland, Mich., on

THE SUGAR MAPLE,

in its relation to the forestry question. He opened with the following announcement:

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"It will be the purpose of this paper to show, that, within the maple belt, no other tree lays equal claims to the attention of those interested in the preservation of our forests, nor offers so good and economical means for the accomplishment of that purpose. To this end I shall endeavor to show: First, that the sugar maple fills all desirable conditions for forestry purposes better than does any other tree; second, that, everything considered, the maple sugar industry pays a better profit than does any other ordinary farm enterprise; third, that it may be considered in the light of a permanent investment, and that by virtue of this tree our forests within the maple belt may be rendered sources of revenue for all time—the most certain means to their preservation."

He called attention to the fact that timber trees declare dividends only at death and that nut-bearing trees and sugar-yielding trees make annual dividends, the trees still surviving. Of the two latter the sugar trees have the advantage because from their limited habitat there can never be an overproduction.

To illustrate the profits that may accrue from a "sugar bush" Mr. Davenport gave the record of his own business briefly as follows:

We tap one thousand trees which are scattered over forty acres of land. It is by no means a choice piece of timber, as the same number might, and often do, stand on twenty acres. Besides the land our cash investment is about $750.00, divided as follows:

1000 tin pails @ 25 cts	$250 00
2000 Post's spiles @ 3½ cts	70 00
Sugar house with tank	150 00
2 evaporators	250 00
Miscellaneous	30 00
Total	$750 00

Our annual product sells for from $350.00 to $500.00, with an average of about $400.00, from which we deduct expenses as follows:

Labor, fuel, etc	$100 00
Wear of apparatus	15 00
Interest on $750.00 @ 6 per cent	45 00
Total cost of manufacture	$160 00

This leaves an average annual net profit of $240.00. I make no deduction for taxes, as I consider them offset by the value of the land for pasture and of the timber for fire-wood. As all expenses have been deducted, the $240 may be considered as the income from an investment in forty acres of maple timber, which is six per cent on the value of the land at $100.00 per acre. This is above its market value. If the money value of the land be $50.00 per acre, the investment yields a dividend of twelve per cent. This is a net profit of twenty-four cents for each tree, and every maple tree thus represents a money value of $4.00 for sugar purposes. This is reckoned on the basis of syrup at one dollar per gallon.

Mr. Davenport by statistics showed that the market for the product would always be good, and illustrated by facts within his own observation that sugar orchards could be as permanently valuable investments as any other property in which the farmer could invest. There must be the same regard for succession that the successful orchardist manifests when he has a young orchard in its prime at the time the old one enters a decline. A maple tree that has reached its maturity should be used for lumber and fuel, and the

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sapling that sprang up not far away should have been nurtured to take its place. By proper management a grove of maples may be continually renewed and the young trees will be more valuable than the older ones, because grown under conditions that are to be constant; while the cutting away of large areas of timber has left the older trees open to changes to which they have never been accustomed.

With reference to the discouragement in planting, produced by the length of time before returns may be expected, Mr. Davenport remarked:

"True it does take time, but do as our old friend Josh Billings used to say, and 'set them out a good while ago.' It takes time to raise an orchard of fruit trees. Nature has favored us, let us provide for posterity. Neither does it take so long a time as we might suppose. Groves of maple that within my recollection were small trees are now tapped. I knew one tree by the roadside that forty years ago was a little switch preserved by one of the early settlers. It is now eighteen inches in diameter, and has a beautiful top forty feet across. Trees along our place, set twenty years ago, are nearly large enough for tapping, and they have been all the time in a June grass sod. Thirty-eight years ago, in a township adjoining my own, ten acres of oak were girdled and left to fall down and rot upon the ground. From that day to this nature has had her way in that old slashing. She set about covering the disgrace. The winds scattered those little winged seeds among the rotting logs, and to-day the ground is covered with a dense grove of maples with scarcely a tree of any other species. It is said that over three thousand thrifty maples now stand on that ten acres, many of them large enough for tapping. I would rather have that ten acres of maple grove than any twenty acres of farm land in Barry county. These instances show what maple trees will do without care, and under circumstances when even apple trees would make but a sickly growth or none at all."

Mr. A. C. Glidden, of Paw Paw, gave a short paper on

MANAGEMENT OF THE RESERVE WOOD LOT.

After stating the proposition that all the management necessary was to take out the mature timber and give the growing trees the best opportunity to develop, he discussed the question of economy in having any reserve wood lot at all.

He questioned if the farmer should be influenced by any theories of scientific gentlemen with reference to the climatic influence of reserved timber areas, when he has the fact staring him in the face that this land has a definite value to him for the production of crops above its worth in furnishing him wood and timber. He argued that the farm wood lot and the reserve timber lot will stand or fall, from considerations of evidence more palpable than these. If the wisdom of the few is to control the action of the many, the agument for replanting must be predicted upon a more substantial basis. It must be shown that present or prospective profit will certainly attend the enterprise, or the whole matter must be relegated to the management of experiment stations, to test the expediency of the project.

Prof. L. H. Bailey talked to the convention about

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WINDBREAKS FOR THE FRUIT GROWER,

making the point that there is greater difficulty in the growing of fruit in Michigan now than formerly, owing, in large measure, to the deforestation of large areas. Forest aids the fruit grown in two important respects:

1. It prevents the disastrous effects of sweeping winds. 2. It conserves and regulates atmospheric moisture. It is very doubtful if the extremes of temperature or fluctuations in annual means are more intense in Michigan in recent years from the effects of forest removal. It may not even be true that there are more high winds now than formerly, but it is true that winds sweep over the farm with greater force. Winds sweep the surface and bear away the moisture of the soil at the same time that they come in contact with the trees and bushes themselves. The effect of the windbreaks is to check the force of winds in prescribed areas. It has a local influence.

Prof. Bailey made the following practical suggestions with regard to the making of windbreaks:

1. The windbreaks should not obstruct atmospheric drainage.
2. The windbreak should never be dense enough to force the buds on fruit trees in those localities which are subject to late spring frosts.
3. As a rule, in localities where atmospheric drainage will not be seriously checked, the windbreak should have a comparatively dense bottom, formed by undergrowth or low branching trees.
4. So far as practicable, the windbreak should be planted at a distance of six rods or more from the fruit plantation.
5. Native trees are preferable for windbreaks.

A STATE FORESTRY RESERVE.

President E. S. Holmes, of the Michigan State Sportsman's Association, presented the following resolutions which had been adopted by that body:

Resolved, That it is the sense of the Michigan Sportsmen's Association that a State Park would prove a great public benefit in the protection of game, our forests and the sources of our streams;

And we desire to urge the State Forestry Commission to take active measures in that direction.

Resolved, That the President be requested to present the foregoing resolution to the Forestry Commission and to urge the favorable consideration thereof.

All which I certify, Jan. 27, 1888.

MARK NORRIS, *Secretary.*

The above resolutions were adopted at a meeting of the Michigan Sportsmen's Association held in Detroit January 25, 1888.

Dr. Holmes gave as the reasons for the association's action: That a State Park would prove a great public benefit in the protection of game, forests and water courses.

Seth Green has said that an acre of water may be made to produce more food than an acre of land. If so, how important to preserve our springs, lakes and rivers. The Almighty does not forget us. He still pours his rains on the just and the unjust, and it is our duty to conserve these rains and turn them to the best account. We desire the reserve as a protection to fin, fur and feather; as a sanitary influence for the whole State; as a preserver of the Manistee, Muskegon and Au Sable. As a preserve to game it would serve as a breeding and development grounds for animals and fishes to go out into the rest of the State.

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Mr. Perry Hannah, of Grand Traverse, said:

As a boy, rafting down the St. Clair, I used to enjoy anchoring on the "flats" where there were millions of ducks. Many a time I have gathered a bushel of eggs in an hour or two. To-day there is not a duck where there were thousands then. Now, if we had such a preserve, would all the game go there and stay? If we can realize sufficient advantages from such a park it can be had. The question is how is this to prove advantageous to the State? How is it to be a paying investment?

Mr. Garfield:—A leading lumberman told me a short time ago that if we could have a tract of land protected from fire, thieves and hunters it would soon teach us just what you are asking for.

Mr. Hannah:—There are hundreds of acres of light sandy land, from which all timber has been cut or burned, and on which there are nothing but bunch grass. I would like to see those acres put to some use. I move the adoption of the resolutions submitted by the Sportsmen's Association.

The resolution was adopted.

C. W. Garfield remarked:

Since the organization of the commission, I have felt that if it could crystalize but just one thing, and that, to set aside and preserve from vandalism an area of native forest, it would have justified its existence.

A generation ago, forest areas could have been reserved at the head waters of the Grand, Raisin, Kalamazoo and Huron rivers which would have afforded an object lesson of the greatest value to our people.

The more we cultivate out the vegetable matter from the soil, that serves as a sponge, the more suddenly the waters of a rainfall are lost to the land.

Had such reserves been kept, the presence of perpetual reservoirs in the southern part of our State would be a manifold blessing.

It can still be done at the head waters of the Muskegon and Au Sable rivers.

The advantage of such a reserve to science is no small item. There the native flora and fauna would be preserved for future study.

The United States government has reserved the Yellowstone Park for these same purposes, and if we ever wish to do this, the present is the only time.

In 1883 or 1884, Wisconsin reserved twenty-one townships. It was railed at as being a scheme to further the purposes of a few speculators. But the reserve being at the head waters of some of her main rivers, it is not difficult now to estimate somewhat the immense value it is becoming to the State.

Such a reservation would give us data as to facts of tree culture and forest influence that we could not otherwise get. It would enable the State to test these questions on a scale of such magnitude as to be of great value.

A letter was read from Mr. A. J. Daniels, concerning

ECONOMY IN THE USE OF TIMBER,

in which he took the ground that true economy lay in using mature timber as rapidly as there was a demand for it. He was sorry to see so much valuable wood burned in clearing, when so many were in need of it in our large towns, and if some economist would show some fairly profitable method of utilizing it, none would more quickly adopt it than the men who do the burning, for they need the money.

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In conclusion he said: "It seems to me to be true economy to cut all that is necessary to supply the demand, to make that demand as great as possible by inventing methods of using at a profit much of that which is now burned as refuse, and—shall I dare to say?—to cut off and burn it when it cannot be profitably marketed, if the soil is needed for farming purposes."

After passing a hearty vote of thanks to the Grand Rapids Board of Trade for courtesies rendered the convention, the deliberations were closed.

During the sessions of the convention, through the energies of the Grand Rapids Board of Trade, a very full exhibit of the products manufactured from wood in the city was made, delighting all in attendance. Bills of fare at the hotels were printed on veneer by the Grand Rapids Democrat.

An evening was devoted to an ideal Arbor Day exercise under the management of teachers in the city schools, in which a large number of children participated. This exercise was so delightful that it was published by the State Agricultural College as a bulletin for which there was a great demand, and afterward republished by the Agricultural press of the country. This bulletin appears in the volume of the Michigan Board of Agriculture for 1888. This first convention in the interest of forestry in Michigan has seemed to give an impetus to thought and discussion upon forestry topics very profitable to our State and perhaps is more effective than legislative enactment in educating the people towards a truer economy in the management of our tree wealth, but it must be remembered that legislative enactment really provided for this convention.

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FOREST MANAGEMENT IN SOUTHERN MICHIGAN.

[BY W. J. B.]

After traveling extensively in all the southern counties during the last eighteen years, I feel confident in saying that the area of land in forest is constantly diminishing. I know of no pieces of land of much extent where timber has been planted or where trees once cut are again allowed to sprout and grow.

In places where the area remains undiminished, the quality in nearly all cases is deteriorating on account of the common practice of removing many of the most valuable trees.

Again, it is a custom well-nigh universal among farmers, to pasture the wood-lot. By turning in the cattle, sheep, horses and swine, the seedlings are all destroyed, the young trees are often killed or their growth checked by the animals which take off a portion of the leaves. In some portions of the State farmers cut out the undergrowth from their reserved wood-lot to improve its appearance. When the undergrowth is removed by any process, and some of the larger trees cut down, light penetrates the forest, and with more light grasses find their way among the trees and a turf of greater or less firmness gives a park-like aspect to the reserve wood-lot. It looks very well for the present, but the grass checks the growth of the trees.

It needs no deep deliberation of a philosopher to see that the days of all wood-lots thus treated are numbered. Some may say that it is not worth while to try to retain any forest in the older portion of our State. That we can buy timber cheaper than we can raise it; still we feel sure that nearly every farm is managed with greater profit to the owner where more or less of it is kept in forest. Not enough attention is given to filling in open places with kinds of trees which will be most valuable to grow for future use. The trouble and expense is not so great as most suppose.

"A German farmer would as soon allow his cattle to range in his wheat fields as in his forests, which often prove the most profitable part of a European estate. In this country the wooded part of the farm is not cared for, nor protected in a way to maintain and increase its value. It is always used as a pasture, in spite of the well-known fact that cattle are fatal to a forest. The trees are either all cleared off at once, without reference to their protection, or are so carelessly selected for cutting, that the character and composition of the woods are ruined."—*Garden and Forest, Vol. 1, page 229.*

"In no branch of agriculture, perhaps, do the people of the United States so need instruction now as in all matters relating to the care and improvement of the woods and woodlands connected with farms. It is almost a universal custom with American farmers to neglect this part of their property, and to be satisfied if the wood lot furnishes a little pasturage to their stock and a scanty supply of half-rotten or worm-eaten wood for the kitchen stove."—*Garden and Forest, Vol. 1, p. 310.*

"The first requisite in forest life is to keep the ground fully shaded—so much so that grass cannot grow—to keep it moist and free from packing, or the tracking of cattle, and to encourage such a growth that drying winds may not enter."—*Canadian Horticulturist, quoted by Garden and Forest, Vol. 1, p. 310.*

FOREST FIRES.

[BY W. J. B.]

This subject, so important to the people living in the newer portions of our State, and in many other States, especially where there are many cone-bearing trees, is one which has perplexed large numbers of persons for a long time.

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It was well discussed at our forest convention held last winter in Grand Rapids.

In the minds of the directors, it has from the time of establishing the State Forestry Commission to the present, seemed to be the one question demanding most careful consideration.

These fires continue to prevail in many places and accomplish great destruction. The sources of the fires are numerous and varied and some of them past finding out. They are sometimes started by careless berry-pickers, river-men, hunters, and often by the engines along the railways.

In a very dry time, on light soil, the dead pine leaves, when touched with a burning match, will spring into fire which will spread at an incredible speed.

If the air is still it moves more slowly and may stop when it comes to some well beaten road.

It is the custom in many places to burn rubbish in early spring where trees have been removed, that it may not be left to burn in a dry time and endanger neighboring forests, or any other property.

There is not often much danger from fires in thickly wooded regions, where there are few or no cone-bearing trees.

There is a great chance for some persons to do philanthropic work in changing the views of some of the settlers in regard to exercising greater care to prevent the starting of fires.

With the present views of the settlers, and their isolated positions it is next to impossible to preserve pine timber from fires without incurring too great an expense by way of guards and other means of insurance.

To save a good pine forest, as the country and the people are now constituted, is a very hazardous undertaking.

For example: Southeast of Harrison, in Clare county, parties own a pine tract of white and Norway pines and mixed deciduous trees, with some hemlock. Most of the surrounding pine has been cut and removed. That remaining, where none has been cut, is tall and thrifty, some of it under size. The most of it, if left, would improve for fifty or one hundred years. The proprietor would very much like to hold the forest for improvement and for better prices. The rubbish on the west was burned in spring; a man detailed near the forest all summer to prevent or subdue fires. July brings dry weather, and one day or night, the fire starts and spreads rapidly, feeding on dead leaves and a small amount of old logs and brush.

Nearly all the young growth is killed to the ground; the fire rages with such fury that it is almost impossible to do anything to allay it or to save the life of some of the best trees which are in danger. The owner has lost much by the fire and must change his plans. The dead timber must soon be cut to keep it from damage by insects and decay. The owner and the people of the neighborhood suspect that the forests were set on fire by some one for the purpose of killing the trees, so that laborers could find employment next winter. The owner offers a reward of five hundred dollars for the conviction of the guilty man, with scarcely any prospect of having to pay the reward. If he hold the living timber, he must clear roads through the forest and watch it at a high cost. He probably now prefers to pattern after most other proprietors of pine forests, viz., to cut and remove what remains as soon as possible, realizing all he can, rather than to run the great risk of holding it for improvement at a better price.

To give another illustration: Salling, Hanson & Company, last spring

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Fig. 1

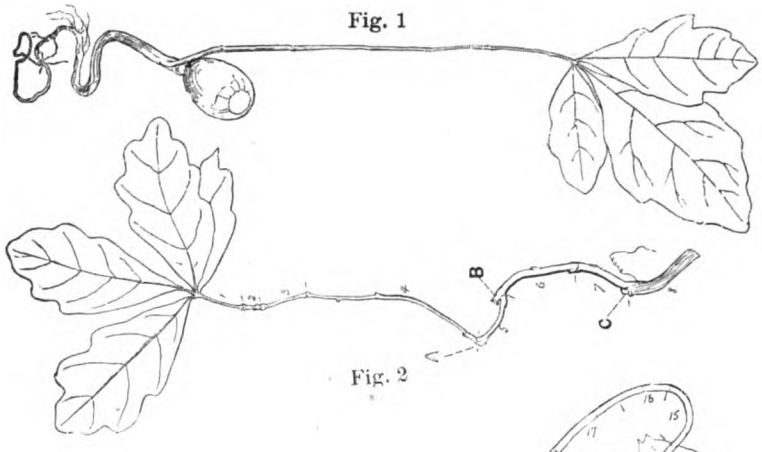

Fig. 2

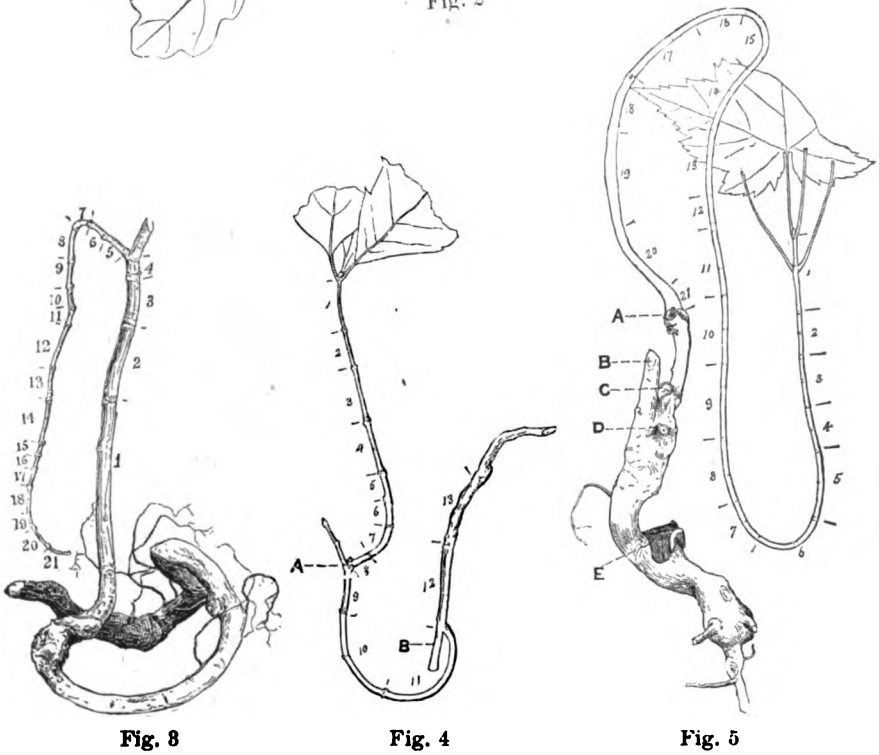

Fig. 3 Fig. 4 Fig. 5

Fig. 1.—A young white oak, two years old, from a dense forest; the "shell" of the acorn still attached.
Fig. 2.—White oak, at least eight years old, from dense forest.
Fig. 3.—White oak, at least twenty-one years old, from dense forest.
Fig. 4.—Black oak from dense forest; showing the age and dead branches.
Fig. 5.—Red maple from dense forest: the twig bent in drawing to save space; age, twenty-one years. See the scars, A, B, C, D, E, where former stems have died back.

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owned an isolated piece of 80 acres of nearly pure Norway pine forest, in Crawford county. The forest was quite destitute of any dead tops or other rubbish; the surrounding dead materials had been previously burned. On August 15, by some unknown measure, fire was started and spread with great rapidity. There was no use of making any attempt to stop such a quick, fierce fire. The damage was probably about ten thousand dollars. The proprietors say it is impossible to watch such lands to any purpose.

There is no denying the fact that a new country, where cutting logs, manufacturing lumber and shingles is the leading business, abounds in rough characters who do not hesitate to do most any mean thing when there seems to be any excuse for it.

Fires are seldom very troublesome in dense deciduous-leaved timber, especially where the land is loam or clay.

OBSERVATIONS ON THE SUCCESSION OF FORESTS IN NORTHERN MICHIGAN.

[BY W. J. B.]

It has often been observed by many persons that when a virgin forest is removed by cutting or killed by burning, or by both causes, that if left to itself, the succeeding growth differs in part at least from the original forest.

Various reasons, including many theories, have been given to account for this change, while there are a large number of people who do not pretend to understand the subject.

One teacher of science advanced the theory that acorns and hickory nuts and other nuts and seeds of trees retained their vitality in the soil for a hundred years or more, and when opportunity offered, they were ready to germinate and produce trees.

Another class of persons entertain the views contained in the following quotation:

"When one form of life has been destroyed, another takes its place. When, for instance, a forest of pines has been destroyed, anothor, not of pines, but of oak and chestnut, springs up in its room. It does not appear, as the result of a great number of observations, that by the so-called processes of nature, acorns and chestnuts were planted after the destruction of the pine tree, but rather that the germinal principle was in the ground, waiting for the proper conditions to develop it. A multitude of similar instances of the spontaneous growth of new vegetation, replacing that which has been burned or otherwise destroyed, are cited by observers."*

Some writers believe that certain kinds of trees exhaust the soil of certain substances, and that other trees follow which require different conditions.

But on investigation, we find that forests of the same sorts in some instances have held their own and have thrived for 1,000 years in succession; such as beech, fir, and spruce in Germany. Foliage, dead limbs and trunks enrich the land by returning a good share of the best materials to the soil.

"If we compare the amount of mineral substances which are severally removed by a field crop and a timber-growth, we find that a wheat crop abstracts from the same area five times as much inorganic basis as the beech, ten times as much as the pine, the turnip ten times the amount of the beech, and twenty-two times that of the pine.

*LIFE TEMPORAL AND ETERNAL, by Rev. Wm. R. Hart. Published by J. B. Lippincott & Co., 1882

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"The wheat contains of potassium five times as much as the beech, and nearly ten times as much as the pine; of phosphoric acid five times as much as the beech, and ten times as much as the pine; of sulphuric acid fifty-seven times as much as either tree."*

These three substances are the most precious ingredients of the soil, and the ones most apt to be rapidly reduced by heavy cropping.

Within the past thirty years I have observed several tracts of land of limited extent in Lenawee county, in southern Michigan, where severe winds had blown down most of the timber. This timber was composed entirely of deciduous trees, unless it be a few tamaracks in swamps. Fires were not allowed to spread over the ground, and very soon a thrifty young growth of mixed deciduous trees was fully occupying the ground. Not a pine, nor spruce, nor hemlock, nor any other cone-bearing tree, nor any chestnut nor birch could be found on high ground. Those last named were not to be found in that part of the State, hence there were no seeds nor young trees of these species ready to spring up when the first growth should be blown down.

During the past summer, I have had many opportunities of examining large tracts of land in Northern Michigan, where there were many kinds of coniferæ and various species of deciduous trees. In a trip by wagon from Lake Huron to Lake Michigan, I started with this subject strongly impressed on my mind. I have spent considerable time besides this, in visiting the forests and burned districts, and looking at the second growth and observing what was there growing. For example, at Harrison, near the center of Clare county, there is an admirable chance to study this subject. The soil varies considerably, though most of it is sandy.

In imagination let me conduct you to a fine virgin forest two or three miles southeast of the village. The land is rolling and thickly timbered with tall trees. We shall find much thrifty white pine and Norway pine, and in places, considerable hemlock. There are scattering trees of red maple, white and black and red oak, a little beech, and small white ash, some hazel, witch hazel, maple-leaved viburnum, New Jersey tea, mountain maple, large-toothed aspen, now and then a plant of dwarf huckleberry, blackberry, dewberry, eagle fern, sweet fern, dogwoods, choke cherry, black and pin cherries, June berry, and other shrubs and perennial herbs which are deep rooting. In some places the undergrowth is quite thick, but often the large trees are too thick to permit many small tree to grow, at least for them to thrive well enough to conceal the ground. The leaves are usually well packed to the ground, as they were when the snow melted last spring. Where the land was sandy, all of these leaves were dry enough to burn, and about July 25, fire had spread over a considerable tract of this land. There are evidences that fire has formerly run through these woods on several different years, killing the young timber and all under growth to the surface of the ground and often damaging or killing some of the larger trees. There are very few young pines and hemlocks, though cones are found in abundance. The thick layer of deciduous leaves on the ground leaves little opportunity for the delicate seeds of the coniferæ to produce trees.

Let us look for young deciduous trees.

Here are a few very slender oaks of two or three species, some that are eighteen feet high and less than one inch and a half in diameter near the ground; yes, and there is now and then one which has died to the ground, apparently smothered for want of light, but a few spindling sprouts are coming

* B. E. Fernow, in AMERICAN JOURNAL OF FORESTRY, p. 71, 1882.

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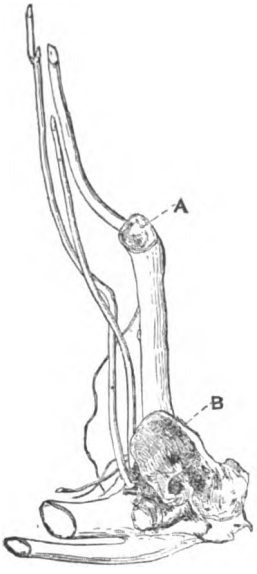

Fig. 6

Fig. 7

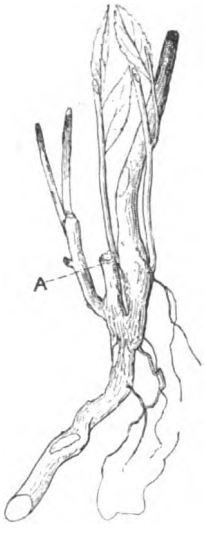

Fig. 8

Fig. 9

Fig. 10

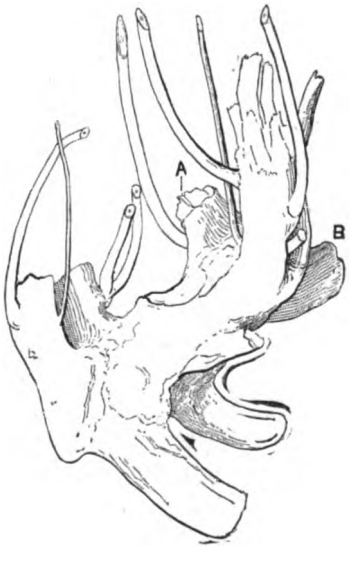

Fig. 11

Fig. 6—Witch hazel from dense forest; more than once burned over.
Fig. 7.—Low willow; several times killed back by fire; still alive.
Fig. 8.—Huckleberry from dense forest; killed by fire and putting up new growth.
Fig. 9.—Blackberry killed back by fire and beginning to send up sprouts.
Fig. 10—Sweet fern; formerly several times killed to the ground by fire; still living.
Fig. 11—Service berry, still growing, though on numerous occasions it was formerly set back by fire.

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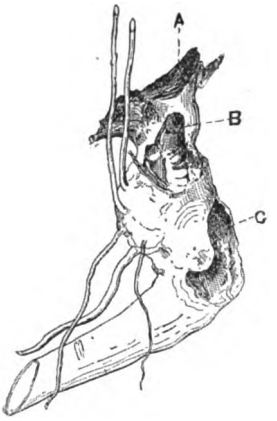

Fig. 12

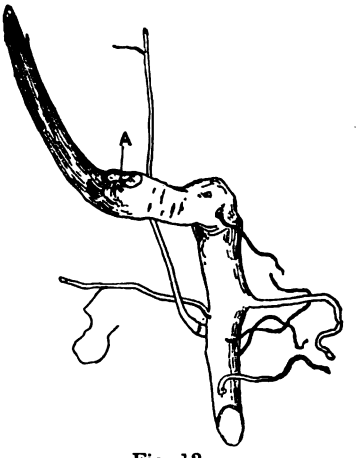

Fig. 13

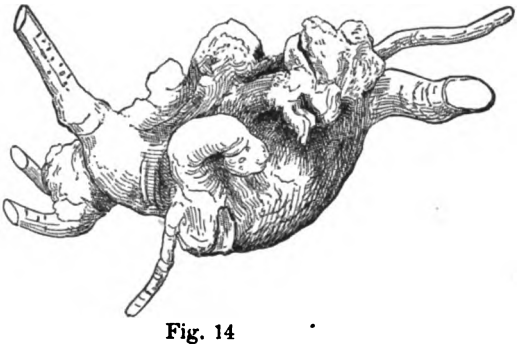

Fig. 14

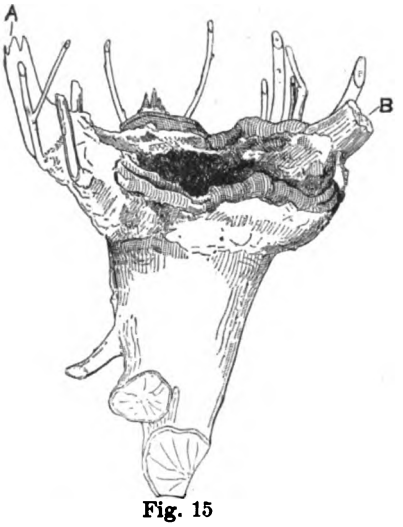

Fig. 15

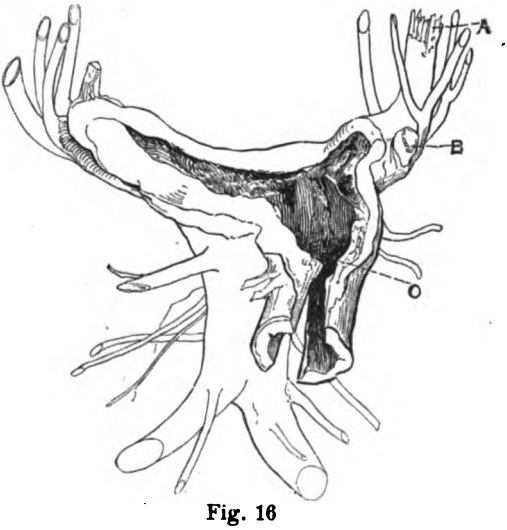

Fig. 16

Fig. 12.—Grub of white ash sprouting; stems had several times been killed by fire on former years.
Fig. 13.—Large-toothed aspen, sprouting from a stump.
Fig. 14.—Grub of black cherry still sending up sprouts. It had several times suffered by fire.
Fig. 15.—Grub of white oak many times killed back; dying at the middle, sprouting on the margin.
Fig. 16.—Grub of white oak, doubtless once like Fig 15, now decayed in the middle, including its main root; sprouting on the margins, each time after it was killed to the ground.

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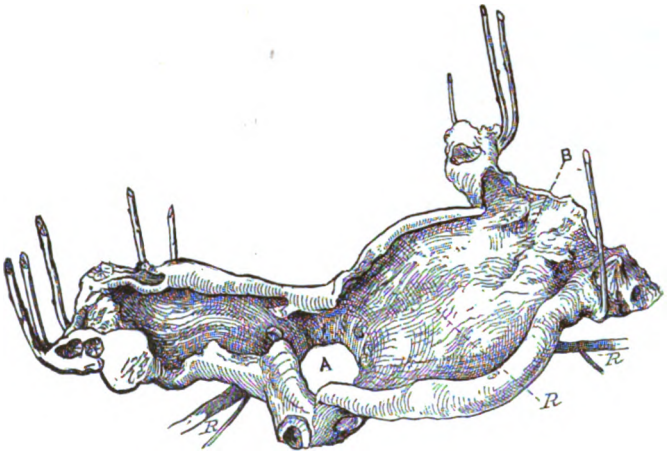

Fig. 17

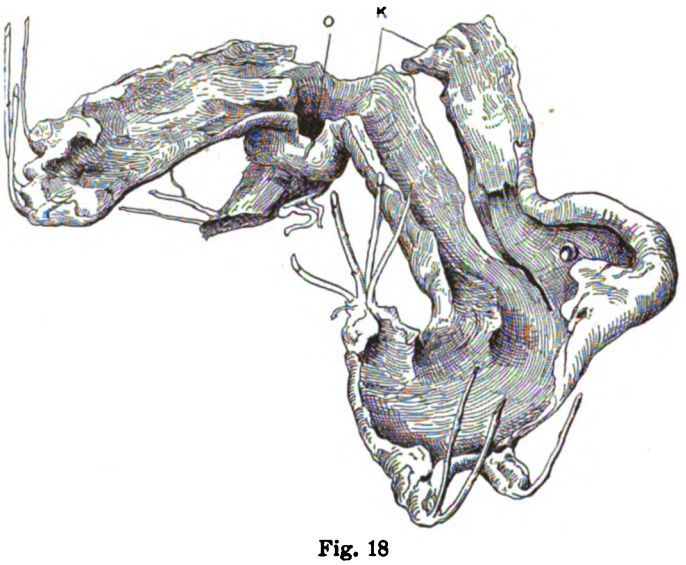

Fig. 18

Fig. 17.—Grub of white oak still older than number 16. There is a hole where the tap root has disappeared. The right hand portion is already dividing. In time, if killed back often, we might have several distinct oaks as descendants from one acorn or grub.

Fig. 18.—Part of grub of white oak, still alive and spreading over the ground the central portions dying, the margins alive and spreading.

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up showing that life still holds out. On digging a few of these slender oaks, we find some of them come from clumped roots, or "grubs" of various sizes, showing that the present growth is the first, second, third or fourth sprout which has apparently come in succession from the same foundation; some of these old sprouts are now represented only by dead stumps, some of which are charred near the ground. By counting the rings of growth in the last sprout, or if small, the bud rings, we may tell very accurately how long since a fire killed the former sprout.

Below the denser growth of large trees we shall be able to find scattering oaks of various ages. On my last visit I brought home two white oaks and one red oak which still had the remains of the seedling acorns attached by the stems of the cotyledons. One of these was five years old. There are others, some four inches high, crooked little things, not the eighth of an inch in diameter, bearing only two or three small leaves. The marks of bud rings show that they may be four to ten years old. On examining some near the ground, we shall find a part of them are the first, second or third sprouts from a small clumped root or grub. It is not difficult to find white oaks under eighteen inches high that are twenty or more years old, and then, this may be the second, third or fourth sprout that has followed in succession, so it is not improbable, that in some cases seen, the parent root or grub was sixty to one hundred years old and the whole now not an inch in diameter anywhere above the ground. Then what shall we say of the age of some grubs which weigh thirty to fifty pounds each? Slender little red maples are rather common in this forest.

There are a plenty not over a foot high and an eighth of an inch or less in diameter that are without question from twenty to twenty-eight years old, and in some cases this is not the first growth, but the second, third or fourth of small size, in succession from the same root.

Some of these pigmy oaks and maples have old charred stumps near the surface of the ground. In like manner we find the other species above named, except that the young hemlocks and pines show no dead charred stumps with living sprouts beside them.

As I formerly stated, in one place about the first of August, the fire had killed for a considerable extent nearly all the small growth of trees and shrubs. Of course there were no signs of sprouting as the observation was made while some of the fires were still burning.

Let us examine an adjoining piece of land of the same character from which nearly all the timber was cut and removed last winter.

Late this spring the fire had swept over this stump land giving it "a good burn."

About August 1st the following sprouts were seen coming up from old stumps, large or small, or from root stocks. To give the complete list of those seen growing in this clearing would be to repeat the list seen growing in the woods near by, except that no pines nor hemlocks were seen on the burned stump lands. On the latter piece were discovered some dog-bane (*aporynum*), one or two wild roses, a milkweed, a dwarf willow, a bush honey suckle, (*diervilla*). These were not mentioned in my list found in the forest, but they are now evidently growing from old root stocks.

No seedling plants of any kind were large enough to make any display, and very few seedlings of any kind were seen. A few poplars were seen on

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the burned land, and these were the large-toothed species, and all came from sprouts from former small trees. A little nearer town is an older piece of stump land, from which the timber was cut two years ago, and some from which the timber was cut still longer ago.

On the older stump lands the sprouts have grown higher, and have spread considerably. Some weeds have made their appearance.

In places, there are small aspens and some birches, especially on low ground. Seeds of aspens, everybody should know, spread freely in the wind, while those of birch often remain to some extent till into winter, and are often blow on top of the snow for long distances.

In another part of the State near Baldwin, in Lake county, virgin forests and stump lands of various ages were studied. The condition of trees and shrubs in nearly every particular corresponds with that given for Harrison.

Let us now turn our attention for a few moments to a very different state of things—a study of the sandy barren plains known as the pine barrens, or Jack pine plains.

About seventy-two species of flowering plants are very uniformly found on these plains. Of this number, sixty-eight are perennials, including a dwarf willow, three dwarf cherries and many other low shrubs.

The number of trees in this list is a small one, and includes two aspens, three oaks and one pine, with occasionally two other pines.

All of the above seventy-two species are admirably adapted to poor soil, to long droughts and frequent burning by fire, with the exception of the biennials and the White and Norway pines. The last two only occur occasionally and come from seeds drifted on to the plains from neighboring territory. The oaks survive the fires for many times in succession in a manner previously mentioned.

I need now only speak of *Pinus Banksiana*, popularly known as Jack pine, gray pine or scrub pine, to show how admirably it is adapted to living on these sandy plains. In many places it is about the only tree growing, and always on these plains it is found in large or in small numbers.

The tree is often killed by fire and never sprouts from the stump, as is the case with oaks, willows, cherries and others. The Jack pine grows readily and rapidly from seed on the sand. It begins to bear cones and seeds in abundance while yet only a few years old, perhaps as young as five years in some cases. These cones in many cases open slowly, some of them never opening to part with their seeds.

We often see cones of this species which are to all appearance perfect, that are ten or fifteen years old, and yet the scales have never spread to liberate their seeds. Unusually dry weather, the death of the tree, or heat from the fire running over the ground, or all of these, cause many of these stubborn old cones to open and allow the seeds to escape. This often happens after the fire has killed every green thing above the surface. In a little time the seeds of Jack pine are freely sown over the surface and are ready to start on the approach of warm weather of the succeeding spring. During the past summer I picked from a single Jack pine tree a lot of cones which were, according to my judgment, from two to four years old. They were placed in a tin dish under glass and exposed to the sun. The cones all opened and many seeds were obtained. These were sown in sand in the laboratory and in five days

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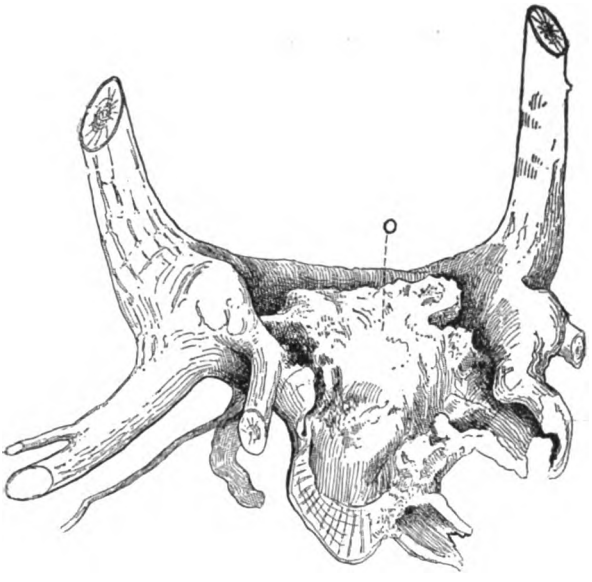

Fig. 19

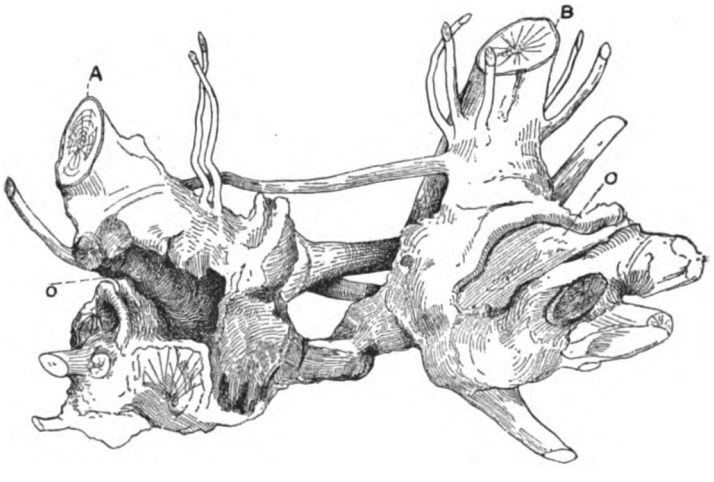

Fig. 20

Fig. 19.—Grub of black oak dying in the middle, where it has been killed back more than once. In the process, if killed a few times more, of assuming the shape of the next figure.
Fig. 20.—Grub of black oak still united, though probably at one time it was much like Fig. 19. Observe that spots O O are dead, and in time each half of this specimen might be separated, as the present group is now separating.

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began to come up. In a short time, 120 out of 125, or about 95 per cent, germinated.

At the same time, from the same tree, I selected old cones which I believed to be from four to six years old at least. From these, 225 seeds were sown, 191 of which germinated, about 85 per cent.

In considering this subject, many are puzzled to account for the production and distribution of seeds from which trees may be started. I will only say here in brief, that in all the cases studied, there were trees in the immediate vicinity old enough and large enough to produce nuts or seeds in abundance. When we consider how long some of the small trees live before attaining much size, and that they often come from old "grubs" very much older, we see that a very light crop of seeds on scattering trees, even once in ten to twenty years, would be sufficient for stocking the ground. Then again, the trees which produced the seeds may have perished long ago, and yet the stunted, slow growing seedlings survived as above shown.

I have seen blue jays carry and drop acorns a long way from the trees on which they must have grown. We know that woodpeckers and crows and sometimes pigeons carry some nuts and seeds for long distances.

I have often seen red and gray squirrels carry nuts twenty to forty rods from where they were picked up at the foot of the parent tree and then bury them in the soil a few in a place. There is no lack of reliable evidence of this character from many good botanists to account for a free distribution of nuts and seeds.

I feel confident that in an hour or two spent in certain favorable places, I could fully satisfy any intelligent person, unless he be unusually stubborn, that it is an easy matter to prove that new forests spring from seeds or the stumps of the old, and that where the second growth is in some respects unlike the first, the change is accounted for in a rational manner.

LARGE TREES.

[BY W. J. B.]

I need not repeat here, but only refer to some measurements of large trees noticed in a paper for the Michigan Pomological Society for 1876.

The "Jack pine," as it is almost universally called in our State, is *Pinus Banksiana.*

Dr. Gray, in his Manual of Botany, speaks of it as a straggling shrub or low tree, five to twenty feet high. On the upper Manistee, at Aurora Frazer's, we measured one of these trees two feet above the ground that was four feet eight inches around, and another four feet and nine inches.

At Walton in Grand Traverse Co., I measured one which took just five feet of the line. In Kalkaska county we measured a white pine thirteen feet six inches around, and another was sixteen feet three inches around.

At Fife Lake, they tell of one within a few miles that girts twenty-three feet and six inches. Near the latter place is an American elm said to be seven feet in diameter.

At Elmira, I measured an elm log that was four feet in diameter. I counted over two hundred and fifty rings.

At Frankport, a nice pin or red cherry, *Prunus Pennsylvanica* L., had a circumference of three feet and four inches.

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At Garfield, in Grand Traverse county, an ironwood was seen with a diameter of twelve inches; a yellow birch, with a circumference of eleven feet ten inches; an arbor vitæ or white cedar, eleven feet two inches.

West of Kingsley, in the same county, there is an arbor vitæ with a circumference of thirteen feet nine inches, almost four feet and four inches in diameter.

In Garfield, a sugar maple was seen that was ten feet in circumference.

In the eastern part of Kalkaska county, we measured a solid and sound stump of a Norway or red pine that was circular and three feet three inches in diameter.

Prof. V. M. Spalding counted the annual rings on a hemlock log two feet in diameter and found 342 of them. On a tree of Norway pine, the same size, there were 210 rings; the slow growing sap of the latter was 60 years old.

THE NAMES OF PINE TREES AS KNOWN TO LUMBERMEN.

[BY W. J. B.]

The botanist will tell you that in Michigan, there are three and only three species of pine, while the lumberman says there are eight or ten. He applies the term "buckwheat pine" to a thrifty, usually young tree of white pine which has a large, low top. It is of no value for lumber or timber. Occasionally some call a tree of *Pinus Banksiana*, "buckwheat pine" if it has the shape above described.

"Sapling" or "Bull sapling," is a name applied to a tall and thrifty white pine with a good top. The branches are rather numerous, the limbs extending downwards pretty well. Such a tree is making a good annual growth and has a thick sap with a relatively small amount of heart wood. The boards will contain many knots, solid or loose, and do not take high rank in the market.

A sapling pine is improving, and in time would become "cork pine." A cork pine is a white pine which has seen its best days. The top is small, and very likely partially broken off or dead; the tree has made only a slow growth for many years, and has a thin sap and much heart wood. The lower limbs have long since disappeared, as the tree has grown among other trees standing thickly around it. The wood of cork pine is ripe and soft, and very nice to work with saw and plane, and finishes into good doors, sash, blinds and furniture.

The red or "Norway pine" (lumbermen universally call it by the latter name) is called "black Norway" when the trees are low and have large tops and a relatively large proportion of sap wood. A tree is "yellow Norway" when it is tall with a small top, when it is making a slow growth and has but little sap wood.

Where trees of *Pinus Banksiana* are short, with large, wide tops, and the proportion of sap wood large, they are called "black jack pine." Where they are crowded, tall, with small tops and a large proportion of heart wood, they are called "yellow jack pine."

CUTTING AND REMOVING LOGS FOR LUMBER.

[BY W. J. B.]

Lumbering in our State has long been conducted on a magnificent scale, though many of the processes are wasteful. Rivers are dammed, lakes over-

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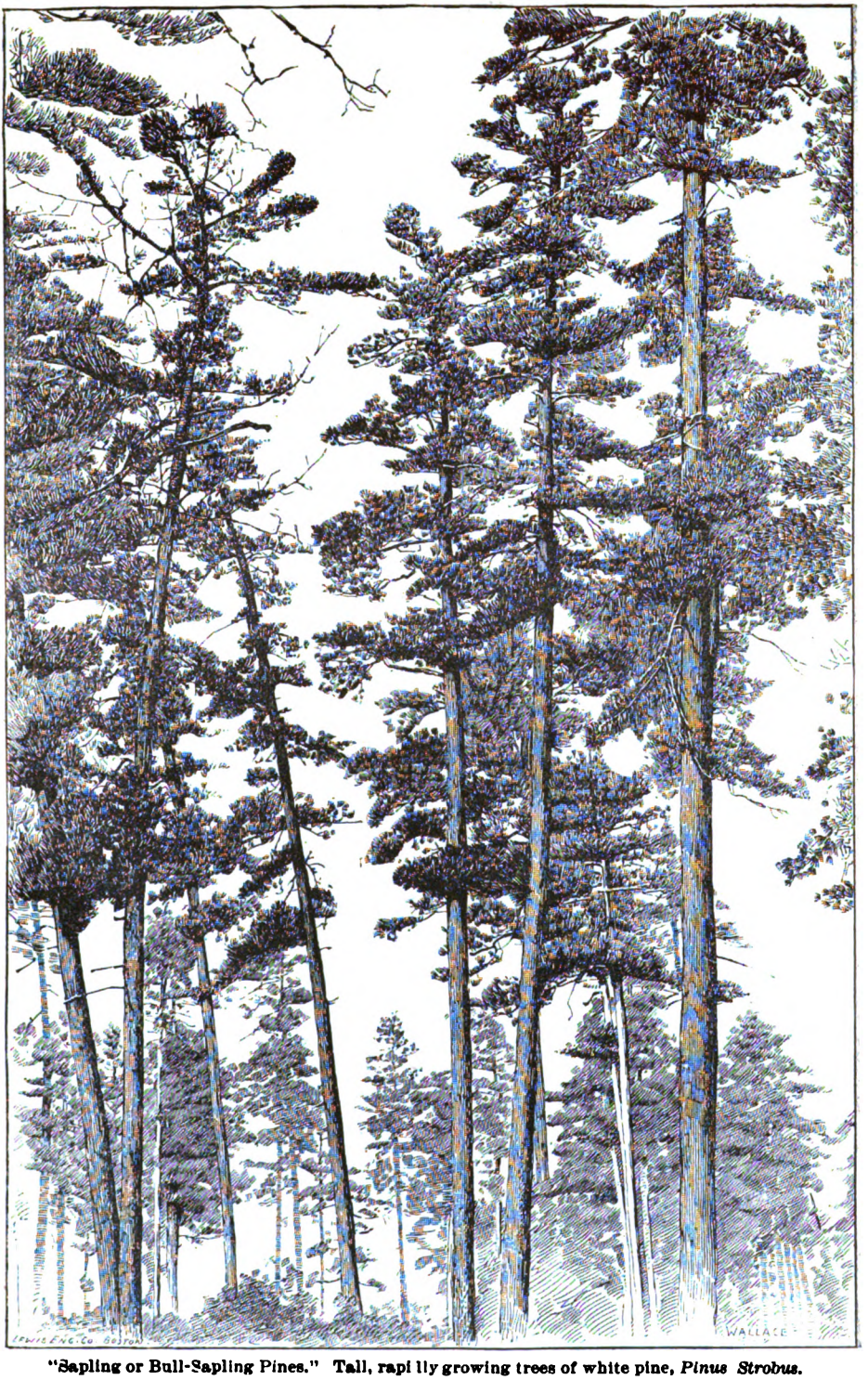

"Sapling or Bull-Sapling Pines." Tall, rapidly growing trees of white pine, *Pinus Strobus*.

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The modern mode of felling pine trees.

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flowed or drained, the forests deprived of vast quantities of young trees, which ought to be left to produce more timber for the future. Desolation follows the track of the lumberman. All of the beauty and most of the value is removed from the land where the timber has been removed. Stumps, rubbish, the poor trees, the small young trees are burned or charred and the ground left to grow up to briers, pin-cherries, poplars, birches, willows, scrub oaks and other worthless trees and plants.

The lumberman cuts and removes the best, leaving the remainder in condition for the fire to certainly follow and destroy it, and moves on to treat one section or township after another in a similar manner. He is after money and is often doing little to improve the country in any respect. To make amends for all this he should accomplish great good elsewhere. We can not help thinking that so far as his ability lies, the poor fellow who follows the lumberman in attempting to improve the land and make a comfortable home is a greater patriot, and deserving of more credit from the State than the man who merely cuts and removes the timber.

All honor to the man who does what he can to improve the country by cultivating fields, planting orchards, building nice houses and good roads!

The changes in the processes of conducting the lumber business within the past few years have been rapid, and each succeeding process more thorough.

The primitive modes of felling trees with the ax and then cutting off the "butt-end" to make it "square," have long since passed away, as has also the custom of drawing a log or two at a load to the river or the mill. Getting in logs once depended on the arrival of snow. About ten years ago there was but little snow all winter. Very few logs were drawn, though many were cut. Logs must be had at the mills to keep business moving. Tramways or pole-roads were devised. Two poles about eight inches in diameter were placed three and a half to five feet apart and fastened to ties. On the poles were cars drawn by horses. These pole-roads were not a great succes, and have not been used much before nor since about the year 1878. On a small scale snow or ice has been drawn to make a road for a sleigh.

For ten years or so, it has been customary to take much pains in grading roads for teams during the summer, sometimes at a cost of one thousand dollars per mile. The grade is very carefully selected, the road made about eight feet wide, with a ridge on each side to keep the load from slewing.

There must be room to let pass a load twelve to fourteen feet wide.

As soon as cold wea her approaches, the sprinkler is set to going. This consists of a box four by four feet and sixteen feet long. They usually wait for a little snow to make it easy to start the sprinkler. In one case, when snow delayed Park, Woods & Company, drew from a lake chunks of ice and broke them up along several miles of road. On this the sprinkler was started and logs were then soon seen on the road. The sprinkler is filled by a horse and two men who make use of a rope and pulley to draw the barrel up an inclined plan over the top of the box on the sleigh. The sprinkler, after the road is once passable, runs only during the night, as it must keep out of the way of the loads of logs. Snow is not thought to be of much use, as it is scraped off as soon as it comes.

The trees are felled and cut into lengths by cross-cut saws of improved patterns which require scarcely more than one-third the time and effort required by the old implements.

To leave the carefully constructed road free from all obstruction for heavy

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loads of logs to descend to the river or the railway, there is an inferior "go-back road" for the use of teams returning empty. The size of loads of logs drawn by one team of horses is enormous. A photograph of such a load strikes a stranger as one of extraordinary size, and he supposes it was put on just to create a sensation and make a fine display in a picture. The sleighs are very stout, with two heavy cross timbers or bunks, often long enough to permit of a load twelve feet wide. The ridges at the sides of the roads prevent the sleighs from getting off the track; the nice grade carefully avoids ascents of much prominence in the direction of heavy loads. The road is a solid bed of ice, often more favorable for drawing large loads than the thick ice on a pond or lake. A load of logs scaling 3,500–5,000 feet board measure is a good load, and is as much as is placed at one time on one railway car. Five tons of such logs make 1,000 feet of lumber. Marsh hay, straw, manure, sand, or other materials are often used where the descent is too abrupt for a team to carry the load easily.

In 1884, a team of apparently grade Clydesdales, weighing 3,100 lbs, belonging to Park, Woods & Company, of Oscoda, drew, at one load, for about a mile, pine logs enough to scale thirty thousand and sixty-eight (30,068) feet, board measure. The logs were mostly sixty feet long, and after cutting shorter for the mill were rescaled and measured over 31,000 feet. The writer has a photograph of this team, load, driver and foreman. The latter gentleman is L. H. Smith. This great feat was performed about twenty miles east of Grayling, in Crawford county, Michigan, and is believed to be the largest load of logs ever hauled on runners by any one team.

When there is no snow on the ground, and the weather is not cold enough to form ice, many logs are drawn for a mile or two on large "wheels," trucks, or, as I should call it, a "cart," having wheels seven to nine feet in diameter. Logs of any length, as long as a tree will make, are slung up under the axle so they will nearly balance. A team is hitched to one end of these logs, and all move off to the lake, the railroad or the mill where the logs are wanted.

They are unloaded quickly, sawed into suitable lengths, each end branded, and very likely soon start on a long journey down a river or on the cars.

The following practice in drawing logs to the railroad is now common:

Long timber—whole trees 50 to 100 feet or more long, are drawn in summer for nearly a mile with one to three span of large horses. The logs are rossed on one side, a log-boat or drag is placed under the front end of the logs which are drawn, one at a time, across other smooth logs which are placed once in about every twenty feet for the whole length of the road.

In 1876, C. Rominger, in the Michigan Geological Report, made the following statement in regard to getting logs to the mills. At that time it seemed to be true:

"The greatest portion of our world-renowned stores of pine timber would be comparatively worthless to the owners, and to the community at large, without these rivers. The rivers are of vital importance to the lumber business as medium, for the transportation of felled timber, from otherwise almost inaccessible parts of the interior, to ports or railroad stations."

At the present time immense quantities of pine logs are every year floated down the rivers of northern Michigan. About 230,000,000 feet will this year go down the Au Sable. The logs are all marked in four places on each end, and subject to certain taxes of boom companies who engage to get the logs safely to their place of destination. The owners of the logs usually raft the

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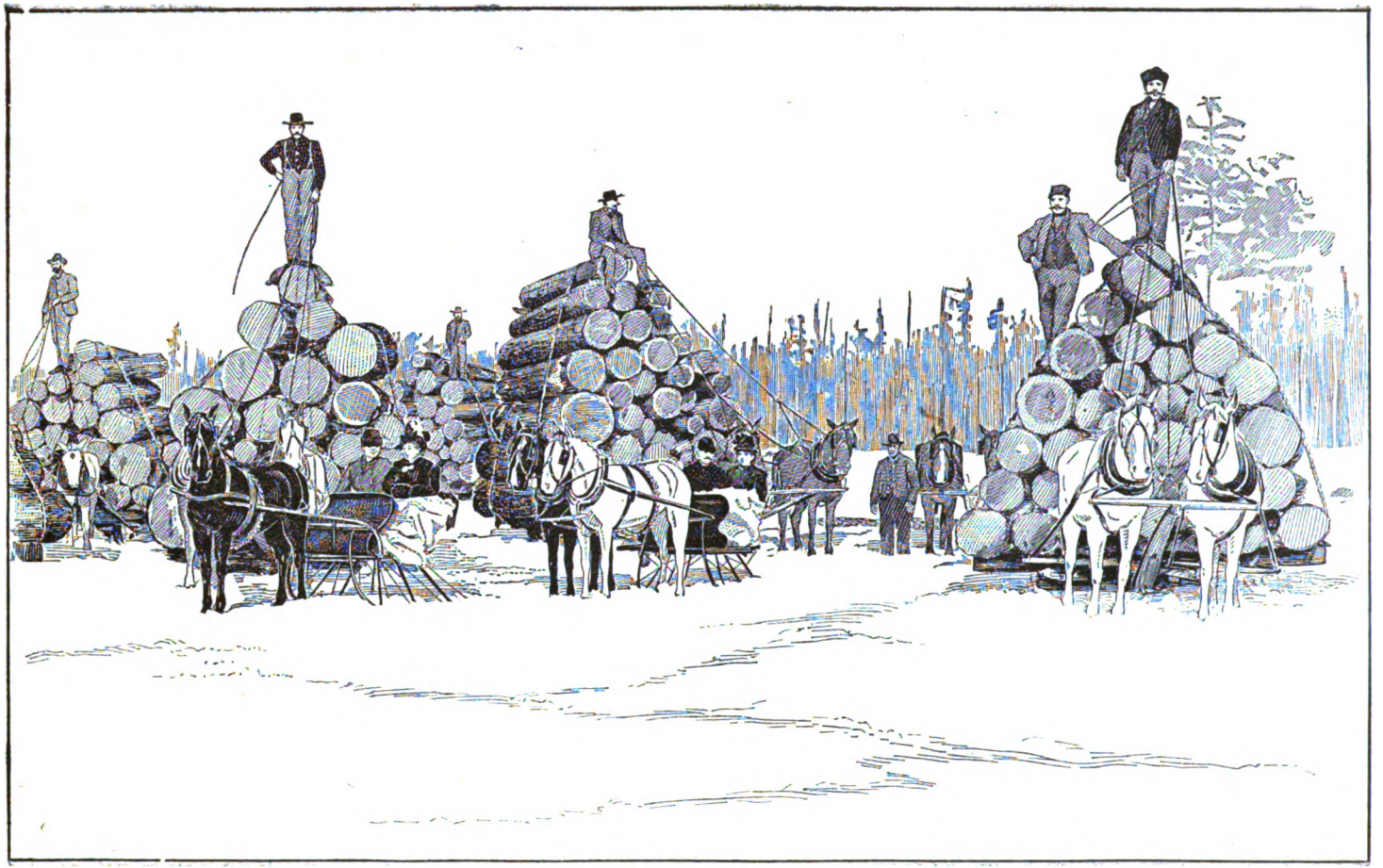

Loads of pine logs at Beaver Lake.

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LEWIS ENG. CO., BOSTON.

The largest load of pine logs ever drawn by one team—30,068 feet, board measure. This was drawn by a team owned by Park, Woods & Co., Oscoda.

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logs down the stream for a certain distance before the boom company takes them. When the water is high enough for moving the logs, men accustomed to the business are stationed at crooked places along the river to keep the timber moving downwards. At certain times they roll all the logs lodged along the shore into the river and clean them all up, "taking off the rear." When the river is rather low, it is sometimes flooded for a part of the day by letting the water form dams in some side stream or in some adjacent lake. In a very dry time the logs stop in various places, waiting for a rise in the stream, and are then said to be "hung up."

The boom companies pay good wages to their men, who are a rugged set of fellows. The work is quite exposing and sometimes dangerous. The men often dress in a showy, checked or gay colored heavy woolen shirt and pantaloons, the latter tightly enclosed at the bottoms of the legs in tall heavy boots which are well made of excellent materials. The thick soles of these boots contain numerous sharp steel nails with points protruding three-eighths to half an inch. Armed with peavey or pike pole each one is at home on the river. He can ride a single log and use it as a ferry boat across a rapid stream, in some cases it is said, ferrying his wife from one shore to another.

Rafting logs down the rivers is not in as high repute as formerly. There are many long delays. Logs are lost in one way or another; some of the sappy Norway pines sink and are lost in that way as they change the current and become covered with sand or mud. The tax of boom companies is high, and in some cases their rules are arbitrary.

Narrow gauge roads have become very common. These often have steep grades and sharp curves. The tracks are removed from place to place to keep near the timber. Wide or standard gauge roads are becoming more and more common for carrying away the timber. Even along the Au Sable there is now a prospect that there will soon be a railroad to transfer the logs instead of trusting them to the water-course.

There are two or more roads of standard width which extend through a crooked course to the west side of Alcona county. There are numerous branches. The cars consist of two sets of trucks, each of four wheels, held together by a reach thirty feet or more in length. Logs fifty to one hundred or more feet in length are placed on contiguous ends of two of these trucks and held there by heavy chains. About twenty such lengths of long logs make enough for one train. The logs are taken to Lake Huron, made into large rafts and drawn by steamers down the lake, often as far as Buffalo, New York. There may be other such roads in the State, but the writer has not seen them.

Portage lake is about five miles long and is west of Grayling about four miles, in Crawford county.

Long logs in summer are cut and drawn with large wheels to the banks of the lake, where they are cut into logs of proper length. They are rolled into the lake and taken by a tug to the northwest side, where a steam engine runs an endless chain up an inclined plane. This carries the logs from the lake at the rate of 2,500 in a day. They are rolled onto the cars of a narrow gauge railroad by horses and chains, drawn three miles and dumped into the Manistee to begin a slow and rough voyage down to Lake Michigan.

H. M. Loud & Sons, of Oscoda, operate what is called a steam skidder. It acts after the manner of a steam plow, and will draw the logs back sixty rods or more on each side up to the railroad track. Another small engine manages a crane which holds a huge pair of tongs which grasp the logs near the middle and puts them on the cars.

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A LUMBER CAMP.

[BY W. J. B.]

In season, this is a busy place of great interest to one not accustomed to such things. One or more low, one-story buildings are made of logs a foot or more in diameter. The houses may be thirty feet wide and fifty or more in length. One or more will be used for sleeping. On either side are wide bunks, two stories high. In one corner of the room are barrels of water, tin basins, soap, towels, and a small mirror. There are boot-jacks, bits of logs for seats, a rough card-table, and there is a leaning chair made of boards for the use of the man who is to be barbered.

The dining-hall looks much like the lodging room, only two rows of long tables with oil-cloth covers stand lengthwise of the room. Near the table are rough benches, and for the meal substantial food like potatoes, bread and butter, pork and beans, fresh beef, and coffee, are supplied in abundance and eaten with apparent relish. The rough unhewed logs on the inside of the room are often covered with newspapers or pictorial magazines. The barns, the office, and perhaps other buildings are often constructed in the same manner as above described. At these camps, travelers can procure meals, as at a tavern, paying the customary price of twenty-five cents.

Some camps employ one hundred or more men the year round. As the timber is removed, the old quarters are deserted and new ones erected.

The men employed are natives of various countries, as Ireland, Germany, France, Norway, Sweden, England, Canada, America. Men of color are unpopular, and are not often met with. In cutting and moving logs the men are considerably exposed to danger. Insurance companies are well patronized, and a moderate annual fee ticket to a hospital is still more popular. Here in case of accident or sickness they are treated free of further expense.

Large camps are often supplied with a store of goods such as are liable to be wanted by the laborers and others in that part of the country.

NEW USES FOR CERTAIN KINDS OF TIMBER.

[BY W. J. B.]

Not many years ago the timber of American elm was considered worth nothing. It is soft, often hard to split and warps badly. To-day, this spongy timber from trees grown on wet soil in a dense forest is valuable for many purposes. The timber is steamed and bent for tops of wheelbarrows, the sides of cheese boxes and many other articles. It is steamed and cut for hoops of barrels, where it was a few years ago considered of no value. Small logs of the aspen were not long ago considered of no value. They have for a few years been much used for making paper. In like manner, freshly cut logs of spruce and balsam fir are now used for making pulp, which is converted into excellent white paper. These changes will affect the selection of species for growing.

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"Black Norway Pines." Low, rapid growing trees of red or Norway pine. *Pinus resinosa.*

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"Yellow Norway Pines." Tall slow growing trees of red or Norway pine, *Pinus resinosa*.

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THE AMOUNT OF PINE YET REMAINING IN MICHIGAN.

[BY W. J. B.

There have been made on this subject many statements wide of the truth, and some severe criticisms have been made on the figures of the so-called "alarmists," but there would be less difference of opinion, if all parties understood each other.

The following was clipped from an editorial of *The Lumber Trade Journal* of Sept. 15, 1888, edited by G. W. Hotchkiss. It explains some of these causes of "misunderstanding" as to the supply yet remaining in our State:

"We concede that if saplings of four inches diameter, dead trees, cutting 80 per cent. mill culls, hemlock, basswood, oak, maple, elm, sycamore and cedar are to be figured against the estimates of standing pine, then our estimates as given to the census bureau were altogether wrong. If we were warranted in basing our estimates upon a lumberman's standard of what constitutes merchantable timber, then we maintain that 35,000,000,000 feet was an over-estimate rather than too low. What is timber? 'Timber is a merchantable grade of material such as will yield a profit to the manufacturer in its cutting, to the dealer in handling, and be available for all commercial purposes.' In 1880 timber was bought upon a basis of its yielding not over 10 per cent. culls, on which the lumberman did not expect to realize the cost of stumpage, logging and sawing. A fair estimate of the entire pine lumber cut of 1887 would place the culls (mill and shipping) at fully 40 per cent. In 1880 the proportion of Norway to white pine was not over 10 per cent.; in 1887 it was fully 50 per cent. In 1880 it was so lightly esteemed that Norway stumpage was undesirable at 50 cents; in 1887 it was sought for at $2 to $3, and sales have been made at double those figures. In 1880 the average white pine cargo of boards at the Chicago market would 'pick' 40 to 70 per cent. 'C' and better, and it is safe to say that 45 to 50 per cent. cargoes were the rule rather than the exception. In 1887 the average cargo of inch boards on the Chicago market ranged from 10 to 20 per cent. 'C' and better, with the 20 per cent cargo occupying the same relative positions in the purchaser's mind that the 70 per cent. cargo did in 1880. To a novice these facts and figures are of little importance; to a lumberman they are as full of meaning as an egg is full of meat. In 1880 a log under twelve inches could scarcely find a market; in 1887 there were mills in Michigan cutting logs of six inches diameter. In 1880 the average log in Michigan, taking the State as a whole, was over 200 feet. In 1887 the average was under 100 feet. To a simple casual observer there is abundance of pine in Michigan; to him who knows and appreciates present conditions, it is apparent that for every acre of virgin forest which is now available for lumbering, there are ten to twenty acres which are being cut over the second, third an l fourth time—largely the third and fourth. From these considerations we are led to modify our original statements only to the extent of questioning the correctness of our judgment as to cutting being done in Michigan for a hundred years to come, for the reserve is being cut very rapidly at present.

"To a close observer the towing of immense rafts of logs from Lake Superior and the Georgian Bay to the Saginaw river is indicative of a waning supply from the sources hitherto relied upon. To the casual observer constantly arriving cargoes at the Chicago market is indicative of exhaustless supplies at shipping points. To the discerning mind a constantly reducing average quality is indicative of a waning supply of commercial stock. To one who cannot distinguish the difference between culls and clear, a board is a board, no matter if it be fit only to make a hog pen, or must be cut into small pieces with heavy waste to be utilized. At the best the vast forests of Michigan have melted away until the most optimistic view can but acknowledge that its end is in sight. A year or ten years' continuance of the products of gleaning cuts but little figure in the general proposition."

As the best pine disappears some of the timber will remain uncut and withheld from market for better prices. Pine will be cut closer, the small and that of poor quality will find quick and profitable sale, where in former years it would not be noticed. A large use of hard woods, importations from other sources, substituting other materials where wood has formerly been employed, will all tend to prolong the supply of pine timber beyond the estimates often made.

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LIST OF TREES AND SHRUBS BELONGING TO MICHIGAN.

[BY W. J. B.]

MAGNOLIACEÆ—MAGNOLIA FAMILY.

Liriodendron L.

L. tulipifera L. White-wood. Tulip-tree.

A fine, large tree, valuable for timber and ornamental planting; not found in northern Michigan, but found from Ionia and Saranac southward.

ANONACEÆ—CUSTARD-APPLE FAMILY.

Asimina L.

A. triloba Dunal. Pawpaw.

A large shrub or small tree, often spreading by the roots. The fruit variable, thicker and shorter than a banana; very likely it may be improved and become valuable. From the Grand River Valley southward.

MENISPERMACEÆ—MOON-SEED FAMILY.

Menispermum L.

M. Canadense L. Moon-seed Vine.

A neat, clean vine bearing maple-shaped leaves; the two sexes of flowers on different plants. Well worth cultivating. A form was found at Mio with the leaves deeply lobed.

BERBERIDACEÆ.

Berberis L.

B. vulgaris L. Common Barberry.

An interesting shrub, not often found out of cultivation, but spreading in the vicinity of the Agricultural College.

HYPERICACEÆ—ST. JOHN'S-WORT FAMILY.

Hypericum L.

H. Kalmianum L. Kalm's St. John's-wort.

A bushy shrub, one to six feet high, sometimes cultivated for its large yellow flowers. From central Michigan northward.

H. prolificum L. Shrubby St. John's-wort.

A low shrub; sometimes cultivated as the preceding.

TILIACEÆ—LINDEN FAMILY.

Tilia L.

T. Americana L. Basswood. Linden.

A soft wooded tree valuable for timber, for shade and for honey. Low rich land, common.

RUTACEÆ—RUE FAMILY.

Xanthoxylum Colden.

X. Americanum Mill. Prickly Ash.

A bitter prickly shrub twenty feet high, bearing small red berries. Common on low lands.

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Ptelea L.

P. trifoliata L. Hop-tree. Shrubby Treefoil.

A thin, straggling shrub ten feet high, sometimes cultivated. Montcalm county and southward.

ILICINEÆ—(AQUIFOLIACEÆ) HOLLY FAMILY.

Ilex L.

I. verticillata Gray. Winter-berry. Black Alder.

A neat shrub two to six feet high, bearing an abundance of bright red berries which often remain till late in winter. Low land. Sometimes cultivated.

Nemopanthes, Raf.

N. Canadensis DC. Mountain Holly.

A shrub six feet high, bearing red berries. Swamps and low land. Montcalm county, southward.

CELASTRACEÆ—STAFF-TREE FAMILY.

Celastrus L.

C. scandens L. Climbing Bitter-sweet. Wax-work.

A climbing shrub with a stem sometimes two inches in diameter. The orange-colored berries open and expose the red seeds which remain into winter. Sometimes seen in cultivation. Flowers of two sexes on different plants.

Euonymus L.

E. atropurpureus Jacq. Waahoo. Burning-Bush.

A clean shrub, six to ten feet high, bearing berries much like the preceding. Cultivated.

E. Americanus L. var. obovatus T. & Gray. Trailing Strawberry Bush. Common, but seldom very conspicuous.

RHAMNACEÆ—BUCKTHORN FAMILY.

Rhamnus L.

R. alnifolia L' Her. Buckthorn.

A low inconspicuous shrub; marshes and river bottoms; common.

Ceanothus L.

C. Americanus L. New Jersey Tea. Red-root.

A bushy plant three feet high, bearing panicles of white flowers, well worth cultivating, but rather difficult to transplant. Sandy woods, common.

C. ovatus Desf.

Much like the preceding. Oscoda to Crawford county and northward.

AMPELIDEÆ (VITACEÆ) VINE FAMILY.

Vitis L.

V. æstivalis Michx. Summer Grape.

A beautiful glaucous vine, with leaves varying much in shape. Rather common northward.

V. riparia Michx. Frost Grape.

Berries very sour. Along streams, common.

Ampelopsis Michx.

A. quinquefolia Michx. Virginia Creeper. Five-leaf Ivy.

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Our most beautiful native vine; often cultivated. Some plants cling well to brick walls; others will not; all will cling in the manner of grape-vines. Common.

SAPINDACEÆ—SOAPBERRY FAMILY.

Staphylea L.

S. trifolia L. Bladder-nut.

A pretty shrub, ten feet or more in height, bearing drooping clusters of white flowers, followed by bladder-like pods an inch in diameter. Sometimes cultivated. Not uncommon.

Æsculus L.

Æ. glabra Willd. Ohio or Fetid Buckeye.

Western Lenawee county, and probably elsewhere south. The tree has a thin top, and is not so handsome as the horse-chestnut.

Acer L.

A. Pennsylvanicum L. Striped Maple. Moose-wood.

A beautiful slender shrub with a single trunk, twenty feet high; bark striped; leaves large. Northern Michigan.

A. spicatum Lam.

A neat branching shrub, twenty feet high. Low land; Lansing and northward.

A. saccharinum Wang. Sugar Maple. Rock Maple.

One of our most common and well known trees. A general favorite for the road, though often troubled by borers.

A. nigrum Michx. Black Sugar Maple.

Not to be distinguished from the preceding by the color of its trunk, but by its stipules, dark drooping leaves which are often pubescent. Found with the other in the central and southern part of the State.

A. dasycarpum Ehrh. Silver or White Maple.

A rapid growing tree bearing long branches, the lower of which are slender and drooping, often planted as are also the two preceding. Along streams, common.

A. rubrum L. Red Maple.

A slow growing tree with gorgeous red and scarlet leaves in autumn. Low lands, common. This and the preceding are often confounded and indiscriminately called "the soft maple."

Negundo Mœnch.

Vn. aceroides Mœnch. Box-elder. Ash-leaved Maple.

A small, crooked tree with green branches. Along streams, central Michigan and south.

ANACARDIACEÆ—CASHEW FAMILY.

Rhus L.

R. typhina L. Staghorn Sumach.

A thin shrub, often spreading by suckers, the stem sometimes six to eight inches in diameter, the pinnate leaves early turning red in autumn; the sour berries are also red and remain till into the winter. Sometimes cultivated. Common.

R. glabra L. Smooth Sumach.

Much like the preceding, only the young branches are smooth. Common.

R. copallina L. Dwarf Sumach.

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A neat shrub four feet high; common on light soil.

R. venenata DC. Poison Sumach. Poison Dog-wood.

To some persons, poisonous to the touch. A fine shrub, and were it not poisonous would be cultivated. Swamps, common.

R. Toxicodendron L. Poison Ivy. Poison Oak.

A trailing shrub or a stout vine clinging to trees by roots. The three leaflets distinguish this from the Virginia creeper.

R. aromatica Aiton. Fragrant Sumach.

A low shrub three feet high, bearing red fruit. Worth cultivating. Not usually common, mostly found on bluffs and sand hills.

LEGUMINOSÆ—PULSE FAMILY.

Cersis L.

C. Canadensis L. Red-bu . JudasTree.

A broad-topped shrub ten feet high, bearing pink flowers before the leaves appear in spring. Rather tender in cultivation. Along streams; Grand River valley and southward.

Gymnocladus Lam.

G. Canadensis Lam. Kentucky Coffee-tree.

A thin-topped tree, bearing a very few clumped branches which carry large compound leaves. The tree has some other striking peculiarities, such as the thin rolled bark, heavy pods an inch and a half wide; a durable red wood. A small tree, sometimes sixty feet high. Low land. Montcalm county and southward; not abundant.

Gleditschia L.

G. triacanthus L. Honey Locust.

A thorny tree with a thin top of crooked limbs. Wood durable; trees sometimes planted for hedges. A tree sometimes two feet or more in diameter. Occasional, along streams in the southern counties.

ROSACEÆ—ROSE FAMILY.

Prunus L.

P. Americana Marshall. Wild Plum.

A well known shrub, on low lands of the southern peninsula. The fruit red or yellow and very variable, indicating that it might easily be improved by cultivation and selecting seedlings. It suckers freely; the flowers are sweet-scented and sometimes staminate or pistillate.

P. pumila L. Sand cherry. Dwarf cherry.

A low, hardy shrub, bearing variable fruit; promising for cultivation after selecting for a few generations. Barren lands of the north and along the great lakes. Worthy a place as an ornamental bush in almost every collection of much size.

P. Pennsylvanica L. Wild Red or Pin Cherry.

A neat, tree-like shrub, having the aspect of a peach tree. From Ionia northward. In places much affected with a fungus causing black-knot.

P. Virginiana L. Choke Cherry.

A very pretty shrub, spreading freely by suckers. When in flower, there are few shrubs more beautiful. Subject to black-knot. Moist land, common.

P. serotina Ehrh. Wild Black Cherry.

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A well known tree of medium size, with a rather thin top producing racemes of white flowers, followed by black fruit which varies much in size and quality. The fruit is a favorite of the birds; the leaves a great resort for tent caterpillars; the wood is durable, of a red color, and much used for furniture. Common, though the trees are usually very small at the north.

Spiræa L.

S. salicifolia L. Meadow Sweet.

A clean shrub, bearing white flowers. Common in marshes and low grounds.

S. tomentosa L. Hardhack. Steeple-bush.

A low shrub, bearing pretty pink flowers. Worthy of cultivating and experiments with seedlings looking towards improvement. Ionia and southward.

Neillia Don.

N. opulifolia Benth. and Hook. Nine-bark.

A branching shrub six to eight feet high, with re-curved branches which retain the loose, thin layers of bark. Flowers white. Just the thing for a bank a little remote from the house. Common along streams.

Rubus L.

R. odoratus L. Purple Flowering Raspberry.

An attractive shrub with large simple leaves and broad compressed fruit an inch wide. Wet places, northward.

R. Nutkanus Mocino. White Flowering Raspberry.

Upper Michigan.

R. strigosus Michx. Wild-Red Raspberry.

A well known shrub, spreading freely by suckers. Fruit red and delicious; the parent of many varieties in cultivation. It has been hybridized with the black-cap raspberry. Common, especially northward.

R. occidentalis L. Black Raspberry. Thimbleberry.

Too well known for its valuable fruits and as the parent of many cultivated varieties; it needs no description here. Fruit sometimes of a cream color. Common, extending to Grand Traverse county on the west side of the State.

R. villosus Aiton. Blackberry.

Common in woods and thickets, spreading rapidly by suckers. Rather variable; fruit sometimes cream colored. Many varieties are cultivated for their fruit.

R. Canadensis L. Dewberry.

Fruit sweet. Some varieties found in cultivation. Old fields; poor land, common.

R. hispidus L. Running Swamp Blackberry.

When exposed to sunlight the leaves assume a rich copper color, and with the slender stem are fine for decorating churches, halls and school-rooms. Abundant in the sands of central and northern Michigan.

Potentilla L.

P. fruticosa L. Shrubby Cinque-foil.

An erect thick shrub, two to four feet high, bearing silky leaves and showing yellow flowers. Wet grounds, common.

Rosa L. [The roses are very variable and difficult to define.]

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R. Carolina L. Swamp Rose.
A neat showy shrub; common in swamps.
R. pauciflora Ehrh. Dwarf Wild Rose.
A small pretty rose. Dry soil; common.
R. blanda Aiton. Early Wild Rose.
Very variable and common northward.
R. Sayi Schwein.
An erect shrub two to six feet high. Sandy plains, Iosco and Oscoda counties and most likely elsewhere.
R. acicularis Lind.
Found with the preceding.
R. rubiginosa L. Sweet Brier.
Pastures; roadsides not uncommon.
Pirus L.
P. Malus L. Common Apple.
Not uncommon; escaped from cultivation.
P. coronaria L. Wild Crab-apple.
A rough-barked tree-like shrub bearing a profusion of very sweet pinkish-white flowers. Fruit very sour. Common in the central and southern parts of the State.
C. arbutifolia L. Choke-berry.
Swamps; Ionia county and northward.
C. arbutifolia L., var. melanocarpa Hook. Choke-berry.
Swamps northward to the center of the State.
C. Americana DC. American Mountain Ash.
A large tree-like shrub, fully as handsome as the foreign species in cultivation.
Crataegus L.
C. coccinea L. Scarlet-fruited Thorn.
A very variable and beautiful hawthorn, capable of trimming into almost any shape. Not as often seen in cultivation as it should be.
C. subvillosa Schrader. Downy Thorn.
A small tree twenty to thirty feet high, sometimes a foot in diameter. Common in central Michigan.
C. tomentosa L. Black or Pear Thorn.
A large shrub found in center and south of State.
C. tomentosa L., var. pyrifolia Gray. Pear Thorn.
Common.
C. tomentosa L., var. punctata Gray. Pear Thorn.
A large shrub, common.
C. Crus-galli L. Cockspur Thorn.
A dense, smooth-leaved shrub. Sometimes tried for a hedge, but the unevenness in the germination of the seeds and attacks of the borer near the ground have caused people to abandon its use for this purpose.
Amelanchier Lind.
A. Canadensis Torr. and Gray. June or Service Berry. Shad-bush.
A small tree with smooth bark, bearing small apples the size of a pea or larger. The tree flowers very early in spring; trunk quite subject to attacks of borers. Common.
A. Canadensis Torr. and Gray, var. oblongifolia T. and G.
A low shrub; common, northward.

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A. Canadensis Torr. and Gray, var. rfoliaundiot T. and G.
A small tree; not common.
A. alnifolia Nutt. Service-berry.
A dwarf shrub or bush, bearing mild red fruit three-eighths of an inch in diameter. Sometimes cultivated for its fruit. Pine plains and vicinity.

SAXIFRAGACEÆ—SAXIFRAGE FAMILY.

Tiarella L.
T. cordifolia L. False Mitre-wort.
A low shrub one to two feet high. Common.
Ribes L.
R. Cynosbati L. Prickly Gooseberry.
Plant and fruit prickly. It may be hybridized with the next species.
R. oxycanthoides L. Wild Swamp Gooseberry.
A straggling shrub, the parent of the Houghton and other American sorts in cultivation. Low land; common.
R. rotundifolium Michx. Wild Gooseberry.
Mostly confined to the Upper Peninsula.
R. lacustre Poir. Swamp Gooseberry.
Stems and fruit bristly. Cool places; Roscommon county and northward.
R. prostratum L'Her. Fetid Currant.
Berries red and glandular with an offensive odor. Northern Michigan.
R. floridum L. Wild Black Currant.
Low lands and along streams, common.
R. rubrum L. A shrub supposed to be of the same species as the foreign one from which our common red and white currants have been derived. Cool swamps, common northward; found as far south as Ann Arbor.

HAMAMELACEÆ—WITCH-HAZEL FAMILY.

Hamamelis L.
H. Virginiana L. Witch-Hazel.
A rather thin shrub, usually healthy; leaves yellow in autumn, not often cultivated, but deserves to be; common.

CORNACEÆ—DOGWOOD FAMILY.

Cornus L.
C. florida L. Flowering-dogwood.
A small tree of slow growth, sometimes eight to twelve inches in diameter. The large showy white bracts around the clusters of flowers make a fine display in early spring. The red berries and the red leaves in autumn add to the attractiveness. The tree is worth more attention, though it is sometimes cultivated. Montcalm county and southward; common.
C. circinata L'Her. Round-leaved Dogwood.
Ravines, common.
C. sericea L. Silky Cornel. Kinnikinnick. From Alcona county southward.
C. stolonifera Michx. Red Osier. Red Dogwood.
This is not a willow in any sense of the word, but a dogwood. Well known for its vermillion colored bark. Attractive to set in masses of ten feet or more in diameter. Low grounds; common.

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C. paniculata L'Her. Panicled Cornel.
Low lands; common.
C. alternifolia L. Alternate-leaved Cornel.
A shrub sometimes twenty feet high, branches green, streaked with white. An attractive shrub for most places. Common.

Nyssa L.
N. multiflora Wang. Pepperidge. Tupelo. Black or Sour Gum.
A tree of moderate size, and slow growth; the branches are horizontal or drooping, the smooth oval leaves red or scarlet in autumn. A very striking and attractive tree. Not often cultivated but deserves to be. Wood often very difficult to split, but sometimes splits readily. Around marshes; common as far north as Gratiot county.

CAPRIFOLIACEÆ—HONEYSUCKLE FAMILY.

Sambucus L.
S. racemosa L. (*S. pubens* Michx.) Red-berried Elder.
The common species at the north. When seen in a mass of ten to twenty or more feet in diameter and in fruit, it make a gorgeous display never to be forgotten.
S. Canadensis L. Common Elder. Sweet-elder.
When in flower a very handsome plant. Were it not for the odor of the young plants, and the fact that it spreads too freely by the roots no doubt it would be cultivated as an ornamental plant.

Viburnum L.
V. lantanoides Michx. Hobble-bush.
A shrub found in the cold swamps of the Upper Peninsula.
V. Opulus L. Bush Cranberry.
An interesting plant found in marshes, bearing a sour red fruit sometimes used for food. By cultivation we have obtained the snowball from this species.
V. acerifolium L. Maple-leaved Arrow-wood.
Two to three feet high. Dry woods in Lower Peninsula.
V. pubescens pursh. Downy Arrow-wood.
A low, straggling shrub; common.
V. dentatum L. Arrow-wood.
Five to ten feet high in wet places; worthy of use.
V. Lentago L. Sweet Viburnum. Sheep-berry.
A tree-like shrub, sometimes thirty feet high; well to cultivate in rich soil.
V. prunifolium L. Black Haw.
Perhaps in the southern part of the State.
V. cassinoides L. (*V. nudum* var. *cassinoides* Gray.) Withe-rod.
Six to ten feet high. Wet soil; common.
V. pauciflorum Pylaie. Few-flowered Arrow-wood.
A low straggling shrub. Upper Peninsula.

Linnæa Gronov.
L. borealis Gronov. Linnæa. Twin-flower.
A neat trailing shrub. Swamps; northward.

Symphoricarpus Dill.
S. occidentalis R-Br. Wolf-berry.
Northward. Rare.
S. racemosus Michx. Snowberry.
Northern Michigan; common in cultivation.

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S. racemosus Michx. var. pauciflorus Robbins.
Upper Peninsula.
S. vulgaris Michx. Coral-berry. Indian currant.
Uncertain.

Lonicera L.

L. oblongifolia Muhl. Swamp Fly-Honeysuckle.
A branching shrub two to five feet high. Rare south; common northward.
L. ciliata Muhl. Fly-Honeysuckle.
A straggling bush. Common.
L. hirsuta Eaton. Hairy Honeysuckle.
Rare south, but common northward.
L. glauca Hill (*L. parviflora* Larn.) Small Honeysuckle.
Not very common.
L. grata Ait. American woodbine.
L. involucrata Banks.
Upper Peninsula.
L. cœulea L. Mountain Fly-Honeysuckle.
Woods and bogs, northward.

Diervilla L.

D. trifida Mœnch. Bush Honeysuckle.
A low shrub. Dry banks and ravines. Common.

RUBIACEÆ—MADDER FAMILY.

Cephalanthus L.

C. occidentalis L. Button Bush.
A crooked shrub bearing spherical heads of very sweet flowers. It grows only in swamps where water is near. Common.

VACCINEACEÆ—HUCKLEBERRY FAMILY.

Plants of this family are mostly shrubs with hard wood, small seeds, difficult of propagation and not likely to survive when transplanted from their native haunts. These are some of the reasons why they are not more frequently found in cultivation.

Gaylussacia H. B. K.

G. resinosa Torr. and Gray. Black Huckleberry.
Dry open woods. Common.
G. frondosa Torr. and Gray. Blue Huckleberry.
Flint, Ypsilanti, Ann Arbor, scarce.

Vaccinium L.

V. Pennsylvanicum L. Dwarf Blueberry.
Very early in fruit; a foot or less in height; dry soil; common.
V. Canadense Kohn. Canada Blueberry.
Swamps, and on sandy plains north.
V. vacillans Solander. Low Blueberry.
Found with the two preceding.
V. corymbosum L. Swamp Blueberry.
Taller, two to eight feet; swamps, common.
V. ulginosum L.
Upper Peninsula.
V. cæspitosum Michx, var. cuneifolium Nutt. Bilberry.

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Upper Peninsula.

V. myrtiloides Hook.
Upper Peninsula.

V. ovalifolium Smith.
Upper Peninsula.

V. Vitis-Idæa L. Cowberry.
Probably in the Upper Peninsula.

V. Oxycoccus L. Small Cranberry.
Ann Arbor, Lansing, and northward. Sphagnous swamps.

V. macrocarpon Ait. American Cranberry.
Common in sphagnous swamps and bogs. Cultivated for its fruit.

Chiogenes Salisb.

C. hispidula Torr. and Gray. Creeping Snowberry.
A delicate creeping evergreen. Sphagnous swamps. Common.

Arctostaphylos Adans.

A Uva-ursi Spreng. Bear-Berry.
A very neat low evergreen. Sandy soil, northward.

Epigæa L.

E. repens L. Trailing-Arbutus. Mayflower.
A favorite evergreen, bearing early fragrant flowers. In swamps at the south, on higher land at the north.

Andromeda L.

A. polifolia L. Wild Rosemary.
A beautiful plant, with narrow glaucous revolute leaves and small pink flowers. Sphagnous swamps. Common.

Cassandra Don.

C. calyculata Don. Leather-leaf.
A shrub bearing early white bell-shaped flowers. Swamps; common.

Kalmia L.

K. agustifolia L. Sheep Laurel. Lamb-kill.
In the vicinity of Au Sable River. Low lands; common. Said by Prof. L. Agassiz to be the neatest plant that grows.

K. glauca Ait. Swamp Laurel.
A neat glaucous shrub, bearing pretty pink flowers. Northern Michigan; not very common.

Ledum L.

L. latifolium Ait. Labrador Tea.
A reclining shrub bearing white flowers. Sphagnous marshes. Northern Michigan.

OLEACEÆ—OLIVE FAMILY.

Fraxinus L.

F. Americana L. White Ash.
A fine ornamental tree; and very valuable for the timber. Southern Peninsula.

F. pubescens Lam. Red or Downy ash.
A small tree, with downy leaves and twigs. Low lands; rather common.

F. viridis Michx. Green ash.
Much like white ash. Ann Arbor, Lansing; not common.

F. quadrangulata Michx. Blue ash.
A slow growing tree bearing light-colored durable heart wood. Rich woods, not very abundant. Southward.

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F. sambucifolia Lam. Black ash.
A common tree in swamps; wood much used for hoops, furniture, etc. The tree when well grown is very beautiful and not appreciated.

SOLANACEÆ—NIGHTSHADE FAMILY.

Solanum L.
S. Dulcamara L. Bittersweet.
A shrubby plant, with slender stems, reclining on other plants for support. It bears red berries, which are poisonous. Introduced into waste places.
Lycium L.
L. vulgare Dunal. Matrimony-vine.
A slender, low shrub; sometimes cultivated.

LAURACEÆ—LAUREL FAMILY.

Sassafras Nees.
S. officinale Nees. Sassafras.
Southern Peninsula. Not abundant except as a very small tree or shrub. Often a little tender, though the leaves and fruit entitle it to a high place as an ornamental tree.
Lindera Thun.
L. Benzoin Meis. Spice-bush.
Noted for its spicy bark and twigs. Low grounds; common.

THYMELACEÆ—MEZEREUM FAMILY.

Dirca L.
D. palustris L. Leatherwood, Moose-wood.
An interesting shrub four feet high, having very tough bark and very soft light wood.

ELEAGNACEÆ—OLEASTER FAMILY.

Shepherdia Nutt.
S. Canadensis Nutt. Shepherdia.
A handsome shrub with scales on the lower side of the leaves. Dry banks about lakes.

URTICACEÆ—NETTLE FAMILY.

Ulmus L.
U. fulva Michx. Slippery Elm. Red Elm.
A thin-topped tree, with reddish, durable wood and inner bark mucilaginous. Rich woods; not abundant, less frequently seen at the north.
U. Americana L. American Elm. White Elm. Gray Elm.
This is the queen among our deciduous-leaved trees for ornamental planting. The timber varies much; if grown in open places on rather dry soil the timber is tough and suitable for wagon-hubs, and is also used after the manner of rock elm; if grown on moist soil in a dense forest the wood is soft, but valuable to cut into barrel-hoops, cheese-boxes, and cheap lumber for wheelbarrows and many other purposes. Low, rich land; common.
U. racemosa Thomas. Rock Elm. Cork Elm.

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A tall, straight tree, when well grown, of slow growth, wood tough and much used in place of hickory and white ash in constructing farm implements. The young branches are covered with ridges of cork. Low, rich land; common.

Celtis L.

C. occidentalis L. Hackberry. Nettle-tree.

When well grown, this is a beautiful tree of medium size. The wood of little use, except for fire-wood. I have received more inquiries in regard to the name of this tree than have been asked of any other. Low lands; common, at least as far as Midland.

Morus L.

M. rubra L. Red Mulberry.

A small tree, having durable wood, not abundant anywhere in the State. The leaves of young trees are lobed, but are simple on older trees. Found as far north as Lansing.

PLATANACEÆ—PLANE-TREE FAMILY.

Platanus L.

P. occidentalis L. Buttonwood. Sycamore.

The largest tree of our State; frequently hollow. The thin bark comes off in scrolls, leaving a smooth, white trunk. The reddish wood warps and checks badly, unless carefully managed while seasoning. Wood is handsome; now used in making furniture. River bottoms; common.

JUGLANDACEÆ—WALNUT FAMILY.

Juglans L.

I. cinerea L. Butternut.

A medium sized tree with a thin top. Wood soft; of a muddy brown color. River bottoms; common.

I. nigra L. Black Walnut.

Our most valuable tree for cabinet work. At one time abundant in the southern half of the Lower Peninsula; now scarce as a large tree. The top is thin; the nuts edible. The tree is often poisonous to others grown near it; as in apple orchards. Of the ten species of the world, Michigan contains six.

Carya Nutt.

C. alba Nutt. Shagbark Hickory.

Well-known for its edible nuts and tough, elastic wood.

C. sulcata Nutt. Western Shell-bark Hickory.

Much like the preceding; nuts large, yellowish. Ionia and southward.

C. microcarpa Nutt. White Hickory.

This tree bears very small nuts; has no shaggy, loose bark. Timber is much like that of the preceding species. Found with the former species.

C. tomentosa Nutt. Mocker-nut.

Reported at Flint and Grand Rapids.

C. porcina Nutt. Pignut.

Woods. Common in some localities.

C. amara Nutt. Bitternut.

Bark smooth; nuts astringent; top thin; moist soil. Common.

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MYRICACEÆ—SWEET GALE FAMILY.

Myrica L.

M. Comptonia C. DC. (*Comptonia asplenifolia* Ait.) Sweet-fern.
A very characteristic low shrub for sandy pine lands.

M. Gale L. Sweet Gale.
Swamps in portions of northern Michigan.

M. cerifera L. Bayberry. Wax-myrtle.
Reported for southern Michigan in Winchell's catalogue.

BETULACEÆ—BIRCH FAMILY.

Betula L.

B. lenta L. Black Birch. Sweet Birch.
The bark of the twigs have the taste of wintergreens. Low lands and swamps from Lenawee county northward.

B. lutea Michx. f. Yellow Birch.
A large tree with yellowish wood, now popular for furniture. Not common south of Lansing.

B. papyracea Ait. Paper Birch. Canoe Birch.
A tree on which the outer bark is white after about ten years of age. A beautiful tree for cultivation, not to be confounded with the white birch now often cultivated.

B. pumila L. Low Birch.
A slender shrub two to ten feet high. Swamps; common.

B. glandulosa Michx. Dwarf Birch.
Upper Peninsula.

Alnus L.

A. viridis DC. Green or Mountain Alder.
A quick-growing "bushy" shrub. Upper Peninsula; common.

A. incana Willd. Speckled or Tag-Alder.
A handsome small tree. Common from Lansing northward.

A serrulata Ait. Smooth Alder. Rare or local.

CUPULIFERÆ—OAK FAMILY.

Corylus L.

C. Americana Walt. Hazel-nut.
A shrub four to ten feet high, spreading freely by suckers. One of our best plants for a thicket; common.

C. rostrata Ait. Beaked Hazel-nut. Common northward.

Ostrya Micheli.

O. Virginica Willd. Iron-wood.
A small tree of very slow growth; wood very hard. Rich woods; common.

Carpinus L.

C. Caroliniana Walt. (*C. Americana* Michx.) Blue Beech.
A branching shrub, with smooth bark over a grooved stem. When grown with plenty of room, this is a very handsome shrub. Low land; common.

Quercus L.

As the oaks are so very common and some of them present such a forlorn appearance in winter when they hold the old dead leaves, they do not appear to be fully appreciated as ornamental trees for the landscape or roadside.

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"Jack Pines" on the plains, *Pinus Banksiana*

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Q. alba L. White Oak.
One of the most common, well known and valuable trees of the State.
Q. macrocarpa Michx. Burr-Oak.
Rich low land; common.
Q. bicolor Willd. Swamp White-Oak.
This common tree affords most excellent timber, which for many purposes surpasses that of white oak. The timber usually sells as "white oak." A rugged tree, low lands; common.
Q. prinoides Willd. Yellow Chestnut Oak.
A medium sized tree with hard durable wood. Leaves very handsome; low lands; infrequent.
Q. imbricaria Michx. Laurel or Shingle Oak.
A very attractive small tree with its entire glossy leaves. Barren land in southern part of State; not common.
Q. nigra L. Black Jack Oak.
A crooked small tree. Lansing and southwest; not common.
Q. coccinea Wang. Scarlet Oak.
A very handsome small tree; especially the small bushy specimens, as seen in autumn, on the open sandy plains in the northern part of the State.
Q. tinctoria Bartram. Black or Yellow-barked Oak.
A medium sized tree; common on dry land.
Q. rubra L. Red Oak.
A large tree, with coarse-grained, red heart-wood; low land; common.

Castanea L.

C. vulgaris Lam., var. Americana A. DC. Chestnut.
A well-known tree, valuable for its durable timber, which is also much sought for cabinet work. Tree beautiful; nuts edible; southeastern portion of our State; not common.

Fagus L.

F. ferruginea Ait. Beech.
In the Southern Peninsula one of our most common and well-known trees. Bark smooth, wood hard and of slow growth. When well grown few trees are more beautiful.

SALICACEÆ—WILLOW FAMILY.

Salix L.

Most of our willows are shrubs, and are indigenous to low lands. They are very variable and difficult to study satisfactorily.
S. candida Willd. Hoary Willow.
Rare south; common northward.
S. humulis Marshall. Prairie Willow.
Especially abundant on pine plains.
S. discolor Muhl. Glaucous Willow.
Common.
S. sericea Marshall. Silky-leaved Willow.
S. petiolaris Smith. Petioled Willow.
Common.
S. *Viminalis* L. Basket Willow.
Cultivated.
S. cordata Muhl. Heart-leaved Willow.

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Common.
S. glaucophylla M. S. Bebb. Glaucous Willow.
Northern Michigan.
S. balsamifera Barrett.
Once found at Flint.
S. adenophylla Hook. Tomentous Willow.
Northern Michigan.
S. rostrata Richardson. Livid Willow.
Common.
S. lucida Muhl. Shining Willow.
Common.
S. nigra Marshall. Black Willow.
A small tree. Common.
S. amygdaloides Anders.
Found at Flint.
S. *alba L.*, var. *vitellina* Cary. White Willow.
Cultivated and naturalized.
S. *fragilis L.* var. *Russelliana* Cary. Brittle Willow.
Introduced.
S. longifolia Muhl. Long-leaved Willow.
Common.
S. myrtilloides L. Myrtle Willow.
Common.

Populus L.
P. tremuloides Michx. American Aspen.
A small, well known and common tree; wood used for making paper.
P. grandidentata Michx. Large-toothed Aspen.
A small tree of Southern Peninsula; wood used in making paper.
P. monilifera Ait. Cottonwood.
A large tree of rapid growth found in the central and southern parts of State.
P. heterophylla L. Downy Poplar.
St. Joseph county and southward.
P. balsamifera L. Balsam Poplar.
A small tree of rapid growth. Common.
P. balsamifera L., var. candicans Gray. Balm of Gilead.
Rare, wild; not uncommon in cultivation.

EMPETRACEÆ—CROWBERRY FAMILY.

Empetrum.
E. nigrum L. Black crowberry.
Upper Peninsula.

CONIFERÆ—PINE FAMILY.

Thuya L.
T. occidentalis L. Arbor Vitæ. White Cedar.
Very common in swamps north of the central part of the State; useful for posts and telegraph poles and for ornamental planting.

Juniperus L.
J. communis L. Juniper.
A spreading shrub about lakes and bluffs; common.
J. Sabina L., var. procumbens Ph. Savin.

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"Yellow Jack Pines." Tall trees of slow growth, *Pinus Banksiana*.

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Trailing over sand-dunes and in some other places of the north.

J. Virginiana L. Red Cedar.

About lakes and along streams; not abundant. This is, perhaps, the most widely distributed of any tree in North America. Wood red, durable, fragrant. Tree beautiful in summer, but becoming dingy in winter.

Taxus L.

T. Canadensis Willd. Ground Hemlock. American Yew.

A trailing shrub; along streams and under trees; northward. Common.

Pinus L.

P. Strobus L. White Pine.

The leading pine tree of the State for lumber; useful for planting in a park or large grounds. Lansing, northward.

P. resinosa Ait. Red or Norway Pine.

A slim, long-leaved pine much valued for its timber. The tree is superior to Austrian pine for planting, but not often employed, as the seeds are not easy to obtain. Sandy land; Isabella county and northward.

P. Banksiana Lambert. Jack, Gray, or Scrub Pine.

A resinous, soft-wooded tree of little use. Sandy soil, from northern Indiana, along Lake Michigan; very common on the light sand at the north.

Picea Link.

P. nigra Link. Black Spruce.

A small tree of slow growth in swamps; wood used for making paper. Ingham county and northward; common.

P. alba Link. White Spruce.

Along the Au Sable and westward, Upper Peninsula.

Tsuga Endl.

T. Canadensis Carriere. Hemlock.

The handsomest evergreen in cultivation. A large tree, making rather coarse lumber. Eaton county and northward.

Abies L.

A. balsamea Miller. Balsam Fir.

Common in swamps from Clare county northward. Beautiful; in cultivation for about fifteen years. Wood used for making paper.

Larix L.

L. Americana Michx. Tamarack. Am. Larch.

A tall slender tree, swamps, common.

SMILACEÆ, SMILAX FAMILY.

Smilax L.

S. rotundifolia L. Common Greenbrier.

A prickly vine sometimes fifteen to twenty feet long climbing by tendrils at the base of the leaves. This and the next are the only endogenous woody plants native of our State. There may be some uncertainty about the identification of this species.

S. hispida Muhl. Common Greenbrier.

Much like the former; common.

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TREES AND SHRUBS OF MICHIGAN COMPARED WITH THOSE OF THE REST OF THE WORLD.

[BY W. J. B.]

Michigan is very rich in trees and shrubs. If I have counted correctly there are 70 species of indigenous trees and three exotics have escaped from cultivation; 150 native shrubs, 5 exotics have spread from cultivation. This gives us 220 indigenous woody plants and 8 exotics which have become naturalized.

To comprehend the relative importance of our trees and shrubs, let us glance at the forests of Great Britain. Great Britain and Ireland contain 121,260 square miles of land, Michigan 60,000, a little less than one-half as much as Great Britain. She has one species of basswood not so good as ours; one maple not over twenty feet high; one cherry from ten to twenty feet high; one small ash, two elms, two poplars, one beech, which grows very large but not very high; one small white birch, one species of pine, by no means a match for our white pine; a species of oak which sometimes grows to a great size.

Great Britain has about ten species of trees native of her soil. Michigan, with half the territory, has seventy species (ninety if we compare the sizes exactly), nine times as great a variety. Great Britian has no whitewood, no white or red cedar, no walnuts or hickories. Michigan has six species of maple of tree size, a basswood, a whitewood, honey locust, Kentucky coffee tree, two cherries, a pepperidge, five species of ash, a sassafras, three elms, a hackberry, a mulberry, a buttonwood, black walnut, butternut, six hickories, about twelve oaks, a chestnut, a beech, four tree birches, four willows of tree size, six poplars, three pines, four spruces, one larch, one arbor vitæ and a red cedar.

The forests of north America may be divided into two regions, the Atlantic and the Pacific. In the Atlantic region there are 292 species, in the Pacific region 153 species.

In all Europe there are only 85 species of trees.

WHY HAS MICHIGAN SO MANY AND GREAT BRITAIN SO FEW?

[BY W. J. B.]

This question now very naturally arises: Why has the Atlantic region, including Michigan, so many species of trees and why has Europe so few? Certainly we cannot attribute this difference to a defective soil and climate of Europe, as they now exist, for Europe can grow all sorts of trees now found in the temperate zone, while "Great Britain alone can grow double or treble the number of trees that the Atlantic States can."

The former geological conditions of their continents help to explain all this difference in the distribution of trees to the entire satisfaction of scientists.

Away back in the Tertiary Period the trees of the regions now possessing an arctic climate were such as now thrive in a warm temperate zone like that of Georgia and California. This is well illustrated by the abundant fossil remains of trees. Following this, came a long time when extreme cold

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prevailed, known as the Glacial Epoch, when snow and ice for most or all of the year extended to the Ohio river. At the approach of cold, the trees slowly retreated southward, as generation followed generation. The plants such as now thrive in southern Michigan, perhaps then extended to what now forms the State of Alabama, while the arctic plants reached Ohio.

As the climate again gradually grew warmer, the trees and other plants slowly migrated northward. Some arctic plants were stranded on the White mountains and in Labrador, where they still remain; others went farther north.

Plants of the cool temperate zone reached Michigan. In a similar manner, during the Glacial Epoch the plants of Europe were driven southward. The Alps, the Pyrenees, the Appenines, the Caucasus, still contain some of these arctic plants which retreated there at the close of the Glacial Epoch. Most of the plants of the warm temperate region had perished and therefore were unable to retreat when the continent became warmer.

I quote the words of Dr. A. Gray, from whom other hints are taken, as found in the American Journal of Science, page 194, 1878. "I conceive that three things have conspired to this loss. First, Europe hardly extending south of latitude 40°, is all within the limits generally assigned to severe glacial action. Second, its mountains trend east and west, from the Pyrenees to the Carpathians and the Caucasus beyond, near its southern border; and they had glaciers of their own, which must have begun operations, and poured down the northward flanks, while the plains were still covered with forest on the retreat from the great ice wave coming from the north. Attacked both on front and rear, much of the forest must have perished then and there. Third, across the line of retreat of those which may have flanked the mountain ranges, or were stationed south of them, stretched the Mediterranean, an impassable barrier."

"Greenland may be referred to, by way of comparison, as a country which, having undergone extreme glaciation, bears the marks of it in the extreme poverty of its flora, and in the absence of the plants to which its southern portion, extending six degrees below the arctic circle, might be entitled. It ought to have trees, and might support them. But since destruction by glaciation, no way has been open for their return."

"In the American continent the mountains run north and south. The trees, when touched on the north by the on-coming refrigeration, had only to move their southern border southward, along an open way, and there was no impediment to their due return. So our lines have been cast in pleasant places, and the goodly heritage of forest trees is one of the consequences."

QUESTIONS SENT TO SUPERVISORS AND THEIR REPLIES.

Before proceeding further, it will be well for the reader to consult page 70, where he can make himself familiar with the law which required the commission to send lists of questions to the supervisors.

It will be seen that sections four and five provide for collection of information from supervisors as to forest areas, forest fires, etc. Whether, in the opinion of the directors, there was a prospect that much or little valuable information concerning forestry could be gathered from answers to questions sent to supervisors, they saw but one course to pursue, viz., to send the questions. These sections were our only guide in the matter, and, in accordance

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with this law, copies of the questions which appear below were prepared and in March sent by express to the county clerks, with request to place them in the hands of the supervisors after their election in April.

The questions were only furnished to those supervisors living in the country, 1,185 in number. There seemed no use in sending to those living in wards of cities.

COPIES OF QUESTIONS SENT TO SUPERVISORS.

1. How many acres of forest land in your township? .....
2. " " " " " " heavily timbered? .....
3. " " " " " thin or cut over? .....
4. How many acres of barren or hilly land might be better covered with forest growth? .....
5. How many acres of forest land were burned over in 1887?
6. Estimate the amount of damage done by such fires to:

   a. cordwood and stovewood, ...
   b. logs, bolts and staves, ...
   c. tanbark, ...
   d. fencing, ...
   e. lumber, ...
   f. bridges, ...
   g. buildings, ...
   h. timber (standing or uncut), ...
   Total loss by fire, ...

7. How did the fires originate? State the number from each cause. .....
8. What methods are found most effective in preventing and checking fires?
9. Does your township, in your opinion, need any forestry legislation? If so, in what directions? .....

At the time of writing this only 722 reports have been received, from the 1,185 lists sent out. Many of these are so incomplete that there seems to be nothing gained by printing the meager statistics furnished. A few reports were complete, but many seemed to consider themselves under no obligation to answer the questions. The following brief notes appear to be about all that can be gathered from the reports which have reached us:

About 488 saw no need for forestry legislation, while 105 made no reply to this question; 128 would like legislation in some form. Of this number 40 want protection from fires; 6 would exempt timber lands from taxation; 10 would have laws to prevent wastefulness by lumbermen; 36 would have laws enforced regarding highway tree planting, while 37 would, by various measures, encourage tree planting for several purposes. By counties the sentiment is as follows:

Alcona.—Four reports, all asking for legislation against fines.

Alger.—Three reports. One says there is no need for law in this direction, and one wants something to protect from locomotives.

Allegan.—Sixteen reports. Eight want no more laws or officials, as the State and county taxes are too high now. Four would like a law to enforce tree-planting on highways.

Alpena.—Four reports. "Give us a law that will fine heavily those persons setting fires in unsafe places from June first to September fifteenth."

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Antrim.—Seven reports. Four want no more laws on this subject, while one wants a law that will kill off speculators and send in actual settlers; and another, anything that will stop non-residents from despoiling so much timber land long before it is wanted for cultivation, and furnishing starters for forest fires.

Arenac.—Four reports. Three are opposed to laws on this subject, but ne wants protection from carless hunters and lumbermen while camping.

Baraga.—One report. No.

Barry.—Nine reports. Six of whom ask for no more law—too much now.

Bay.—Eight reports. No more law.

Benzie.—Six reports. Four say "no," decidedly to the question of legislation. One would make speculators and "land kings" responsible for damage done by fires running from their lands.

Berrien.—Sixteen reports. Ten want no law on the matter, and three would like to see trees planted along the highways, the bluffs covered, and no fallen timber allowed to go to waste.

Branch.—Ten reports, of which seven are negative on the question of law. One says, "We are legislated now till we stand in daily fear of death from tax consumption."

Calhoun.—Twelve reports, all negative.

Cass.—Six reports, all negative.

Charlevoix.—Twelve reports. Nine want no legislation, except to prevent being taxed to death while clearing their land. Report fires as originating from clearings and from railroads, but as doing no particular damage.

Cheboygan.—Five reports, asking the manufacturer to come, to dispose of their surplus timber.

Chippewa.—Three reports. Two want protection from fire, and one does not.

Clare.—Six reports. Three would have pine stump lands protected from fire, and careless persons heavily fined for damage they may have caused by fires. Fires reported as mostly originating from hunters setting, or from clearings.

Clinton.—Fourteen reports. Eleven want no forestry legislation, while two think laws ought to be made requiring tree planting on roadways and hillsides.

Crawford.—Nine reports. Five see no need of laws except upon the matter of forest fires. Four would plant trees on waysides and protect the plains from fires. All report fires as mostly originating from woodmen, river drivers, and sportsmen.

Delta.—Five reports. Two are opposed to law in the matter, while two would like to see the stump lands reset, perhaps by the State. They report fires as originating from locomotives.

Eaton.—Ten reports, and eight negatives. Two would like something that would induce farmers to save more timber, and to stop the draining of tamarack and ash swamps.

Emmet.—Nine reports. "Nothing can be done by legislation." "Farmers will take care of themselves." Report fires mostly originating in clearings.

Genesee.—Seventeen reports. Twelve are opposed to any law in this direction, while three would like a law compelling land owners to plant along streams, boundary lines and highways.

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Gladwin.—Five reports. Nothing wanted except to get rid of the forests. "Too much on hand."

Gogebic.—Two reports. Both want no laws on the matter. Hunters a great cause of fire.

Grand Traverse.—One report. "Make each highway overseer an officer of State fire department with power to call out help and forbid setting fires during dry periods."

Gratiot.—Eight reports. "Farmers can take care of themeelves without any forestry assistance." All say "no."

Hillsdale.—Eleven reports. Seven want nothing in the shape of forestry laws, but three would like anything that would induce land owners to plant trees for protection from winds, etc.

Houghton.—Four reports. The sentiment is, "Of what use is law when large private interests can not protect from fires."

Huron.—Twenty-two reports. Eleven want laws that will induce or compel farmers and land owners to plant and care for wind-breaks, to plant trees along line fences and roadsides, and to prevent the useless destruction of timber on lands unfit for agricultural purposes. Nine want no laws and say the fires have mostly been caused by carelessness in burning fallows.

Ingham.—Seven reports. The feeling is, that fires are of no account, and that no legislation is needed.

Ionia.—Eleven reports. Nine are opposed to legislation, but one favors a law enforcing tree planting along roadsides.

Iosco.—Six reports. All "no." One wants experimental plats set by the State to determine what trees are best for setting on the barrens.

Iron.—Three reports. "No laws wanted."

Isabella.—Nine reports. Seven opposed to legislation, and two have nothing to say.

Jackson.—Ten reports. Eight see no need of it, but two would have laws prohibiting unnecessary cutting of timber from poor lands and hillsides.

Kalamazoo.—Eleven reports. Three would like laws made and enforced so as to secure tree planting along rivers, highways and on waste lands. Six think farmers can take better care of the timber than State laws would. Fires of no account.

Kalkaska.—Seven reports. Three wish for no forestry legislation, while three would have the State or United States plant the plains with pines and protect them. These want trees planted along the roadside. Fires mostly originate from camps and clearings.

Kent.—Ten reports. Solid against more law.

Keweenaw.—Two reports. No legislation needed.

Lake.—Ten reports. Five want legislation to prevent wasteful cutting of timber, to prevent forest fires, and to regulate the use of fire when clearing. Most fires originate from burning fallows. Three think we have too much law already.

Lapeer.—Eleven reports. Four want no legislation on the matter, but three think it would be wise to make every man plant yearly along the highway a certain number of trees, the number varying with the assessed valuation, and that all timber plats should be exempt from taxation.

Leelanaw.—Eight reports. Fires mostly caused by careless boys and sportsmen. Five see no use of law in this direction, while one wants a law that

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will create a market for timber. One wants a law to compel land owners to plant timber.

Lenawee.—Seventeen reports. Eleven see no need for legislation. One thinks Congress should take the tariff from lumber. One thinks ten per cent of the land, if in forest, ought to be exempt from taxation. One thinks windbreaks and other planting should be encouraged by premium. Fires no item.

Livingston.—Six reports. Unanimously in favor of no legislation.

Luce.—Yes, clear and make roads.

Mackinac.—Four reports. Two are silent on the matter of laws, and the other two saw no need of laws for forestry.

Macomb.—Thirteen reports. Ten report as unfavorable to forestry legislation at present, but think it may be needed in the future. No fires.

Manistee.—Eleven reports. Eight think forestry legislation is not needed. Three would like to see laws to enforce the planting of trees on land cut over, the care of those already growing on such lands, and the protection of all from fires.

Manitou.—Three reports. Two "no," and one thinks the present laws ought to be enforced.

Marquette.—Three reports. No laws needed.

Mason.—Ten reports. Six say "no," while three think something should be done to stop forest fires, encourage tree planting, on highways and farm boundaries, and to induce farmers to preserve good wood lots.

Mecosta.—Eleven reports. Nine see no use for forestry laws. One would like laws encouraging forest planting. Locomotives and careless hunters about equally responsible for fires.

Menominee.—Two reports. "No."

Midland.—Ten reports. Five see no need of forestry legislation. One wants laws *compelling* the setting of trees along the highway. Fires caused about equally by berry pickers and tramps.

Missaukee.—Eight reports. Three would have no more laws. Two would do something to prevent destruction of timber and leaving rubbish heaps. Fires mostly from logging railroads.

Monroe.—Ten reports. All negative.

Montcalm.—Thirteen reports. Seven see no need of more laws. Five think there should be more laws and better enforcement of those we already have. "The State should own all land not suited to agriculture and keep it in forest." Hunters and railroads about equally responsible for fires. One says there should be laws to compel the planting of roadsides.

Montmorency.—Five reports. Three want no more laws, while two think the United States government should plant and re-forest the plains. Fires originate from camps and fishers.

Muskegon.—Nine reports. Six say "no" to the question of forestry laws, while two would cover the sand dunes if possible, and have a fire warden to look after the fires during dry times. Railroads and fallows equally responsible for fires.

Newaygo.—Fourteen reports. Eight care for no more law. Three would like to see the barrens covered with trees, and have something done for the pine stump lands. Fires caused mostly by locomotives on logging railroads, and by careless fishermen.

Oakland.—Sixteen reports. Eleven believe the forest owner should

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look out for himself. Three would have timber land exempt from taxation, and would like to see trees planted along roads and upon hillsides and waste places.

Oceana.—Ten reports. Six think laws would do no good. Three think it would be well to be obliged to secure permission from fire warden before setting fires in a dry time. Most all fires caused by fallows.

Ogemaw.—Thirteen reports. Nine say legislation for their section is needless, but three would like to see laws looking toward the covering of the barrens with forest growth. One would offer a premium on forest destruction. Locomotives and fallows the two sources of fires.

Ontonagon.—Five reports. No fires reported. All say "no" to forestry legislation, and one says that for his township it would be a "humbug."

Osceola.—Nine reports. Six think legislation is not wanted now, three think that the young growth on certain sections should be protected from running fires.

Oscoda.—Seven reports; three think fire laws should be enacted, and that the State should see that the so called "barrens" should be reset and protected. Four see no way to legislate to advantage, and one wants more settlers to clear up the land.

Otsego.—Five reports. Fires originate with hunters and those clearing land, but all are emphatically opposed to laws on the matter.

Ottawa.—Eleven reports. Eight are opposed, while three think that some laws might be enacted which would preserve our forest to the extent of ten per cent at least. They report fires as caused mostly by burning fallows.

Presque Isle.—Seven reports. Three see no need for forestry laws, while one thinks something to prevent forest fires would be very beneficial. Three others did not answer.

Roscommon.—Four reports. Three ask for no more laws. One, a law to duce replanting.

Saginaw.—Twenty-four reports. Sixteen are negative. Four are in favor of any legislation that will encourage tree planting on roadsides and barren lands, and to compel the use of spark arresters on locomotives.

Sanilac.—Thirteen reports. Five would like to see some law that would oblige the wayside planting, and protection of trees on strips eighty rods wide along the shore of Lake Huron, and the keeping of cattle off the roads. Fires caused mostly from the clearing of land.

Schoolcraft.—Two reports, both negative. Fires caused by hunters.

Shiawassee.—Seven reports, all negative answers. No fires in the county for years.

St. Clair.—Eight reports. Five think there is no use for more laws, while one thinks roadside planting ought to be encouraged.

St. Joseph.—Fourteen reports. Thirteen say they have had too much legislation, while one thinks there ought to be a law to protect what timber is left.

Tuscola.—Fifteen reports. Eight say no legislation is needed, but three favor the appointment of fire wardens to regulate the setting of fires during dry times. Usually fires originated in burning fallows.

Van Buren.—Fourteen reports. Ten see no need of laws upon the matter, while three feel that something should be done to induce tree planting along the roadsides and upon waste lands.

Washtenaw.—Eleven reports. Eight say "no," as farmers are already

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setting trees along roads and for windbreaks. One is in favor of exempting timber land from taxation.

Wayne.—Eleven reports. All agree in saying that they are in no wise interested in forestry legislation. Land is too valuable to raise timber.

Wexford.—Eleven reports. Seven want no more legislation. One wants legislation to assist in removing forests. One thinks some law should prevent the burning of fallows during dry periods without permit from some authorized person. They report fires caused by careless hunters and fishermen, and from burning fallows.

REPLIES FROM MEN IN THE SOUTHERN COUNTIES IN ANSWER TO QUESTIONS SENT THEM.

List of Questions.

The following list of questions was sent to residents of some of the southern counties of the State:

1. Give instances from your experience or observation of any climatic changes due, as you suppose, to deforestation in your section.
2. Name the changes, if any, in farm, garden, or orchard crops that have resulted from deforestation.
3. Give data of influence of deforestation on the flow of springs, brooks, and rivers.
4. What is the per cent. of timber land in your section? Heavy or light?
5. Is it a common practice to pasture timber lots in your locality? with what results?
6. Is reforestation desirable in your section?
7. What legislation would you advise to increase or improve forest area? That is if such were needed.

The following answers were received to the above questions. They are arranged in alphabetical order.

FROM PROF. A. J. COOK, AGRICULTURAL COLLEGE, MICH.

1. When a boy, we raised peaches with no trouble at Bennington, Shiawassee county. Now the trees die in winter. Then my father kept bees with almost no loss. Now bees die badly. I have supposed this colder climate is due to removal of forests. I think it is.
2. Peaches and more tender apples, once hardy, are not able to resist the recent hard winters. Winter-killing of wheat and clover is also more pronounced in recent years, I think.
3. If the springs, brooks and rivers have changed I have not noticed it. I have fine springs on my farm, and they are flush as ever, I think, though I am not in position to be positive.
4. I think in my township about 15 per cent. is forest and consists of heavy timber.
6. I hardly think so, as yet, further than roadside planting.
7. I think of no way except by tax reduction or otherwise to induce people to leave timber now standing, or at least a good portion of it, and to stimulate tree planting along roadsides.

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FROM EUGENE DAVENPORT, WOODLAND, MICH.

Dr. W. J. Beal, Agr'l College,—Dear Sir:

1. There is a belief that we have more frequent and severe winds than when the country was newer, especially in the fall, winter and spring seasons. That we are less subject to late spring and early fall frosts seems almost certain. When the clearings were small and isolated, they were of the nature of hollows in the great wooded area, where cold air settled and rested. This condition is changed and the air is now usually in motion.

For some reason or other what is known with us as the *maple sugar season* is gradually shortening. Formerly there was a gradual warming up of things as winter merged into spring. In later years we have more sudden changes, with a greater range of temperature, but they are comparatively few in number and the whole thing is soon over.

2. I have no accurate data on this question.

3. All the springs in this vicinity have been lately opened, but the only brook I know here runs much lower than formerly.

4. Between fifteen and twenty per cent.

5. It is common to pasture timber lots; sheep, if on short pasture, will destroy the seedling trees; I have not noticed that cattle do, but their "range" has been large, wherever I have observed.

6. I do not believe that reforestation in the sense of increasing the area is desirable, but in the sense of improving and preserving our timber lots, and in planting open places, waste places and borders, I think it is. Something ought to be done to preserve the young growth of valuable trees springing up in our wooded lots. Our forest area is *large* enough, but not *good* enough. If roadsides, lanes and permanent fences were lined with trees they would do much to temper the biting winds of winter and the heat of summer.

7. I cannot see what legislation can do, either by awards or penalties, to induce owners to care for their timber lot. Perhaps it might induce roadside planting to some degree. If the roadsides could be declared public property, condemned so to speak, public officers take the matter in charge, actually plant the trees and care for them, something might be done. Some such plan as this might be successful, but I cannot believe that legislation alone will ever take hold of the individual owner and cause him to move in this matter.

FROM A. C. GLIDDEN, PAW PAW, MICHIGAN.

W. J. Beal,—My Dear Sir:

Your letter of inquiry relating to forestry questions is before me. I am really sorry that I cannot be in entire sympathy with you in this matter, which you doubtless have so much at heart. I don't believe the facts you will gather will be worth their cost.

I will concede, for the sake of the argument, that deforestation has let down the forces of the upper air current 100 feet or so, and that it is five degrees colder for want of forest protection. This will answer the first question. The results are that we do not have peaches as regularly every year as we did twenty-five years ago. This answers the second question. Suppose this assumption to be conceded, of what practical value is it to the State unless you can find a remedy? Reforesting a large area is such a preposterous project that you would not wish to father it, I know.

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In answer to the fourth question I may say that there are but twenty-four acres of timber upon the section of land on which my farm is situated. This is mostly young, but I do not believe you could add ten acres to this amount, with the consent of the owners, by any sort of encouragement given by legislation. The land is worth more for other purposes, and we will stand the five degrees of cold and be the gainers.

There are some lands along Paw Paw river in my township—Antwerp—too poor for general farm purposes, that might, perhaps, to advantage be planted to white pine. But I believe it is worth more for sheep range than for this. There is not, in my opinion, one chance in one hundred to effect anything in the direction you have outlined on any of the older settled farm lands of the State.

FROM A. A. LUCE, GILEAD, MICHIGAN.

Prof. W. J. Beal,—Dear Sir:

In answer to your questions I will answer to the best of my ability as follows:

1. Sudden changes come more frequently than formerly in winter. These and the extreme drouths of the past ten years or more are, in my opinion, the effect of deforestation.
2. These drouths affect crops of every kind, but especially corn, grass, and garden crops.
3. One stream that formerly furnished power to run a saw-mill four or five months during the year, now has water only in the spring months. Another that supported a mill every three miles is now almost dry during the summer months.
4. About four per cent heavy and six per cent light timber.
5. Yes. It kills the timber.
6. Yes.
7. Lessen the taxes by giving premiums upon forest planting.

FROM T. T. LYON, SOUTH HAVEN, MICH., PRESIDENT MICH. HORT. SOCIETY.

Dr. J. W. Beal,—Dear Sir:

In reply to your questions respecting my experience and observation in forestry matters, I will state that from 1828 to 1874—a period of forty-six years—they were had at Plymouth, Wayne county. Since the latter date I have resided at South Haven, Van Buren county. The chief facts that have come under my observation must, therefore, pertain to the former place.

1. In 1828 the whole interior of Michigan was a dense forest. Plymouth was first settled in 1825. Down to about 1854, peaches had been a certain crop. Such a circumstance as the winter-killing of peach buds had been unknown, or at least unobserved. Since about that period, not only have the fruit buds been winterkilled at least three years out of five—evincing the fact that as the forests disappeared, temperatures reached lower extremes—till, for twenty or more years past, not the fruit buds only, but even the peach trees are frequently killed outright by severe winters. In 1848 to 1852, I planted extensive orchards at Plymouth, among which were a large number of the Heart and Bigarreau cherries, which are well known to lack hardiness in this climate. These were planted on the easterly side of a strip of dense

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timber, where they remained wholly uninjured, till the strip of timber was cut away, giving the westerly winds an unbroken sweep of from two to five miles over cultivated lands; with the result that very many of the cherry trees were winter-killed or badly injured within the next few years.

2. As already stated, peaches have become a very uncertain crop, and have practically gone out of cultivation. Apples, at the first settlement of the country, never were known to be injured by the cold of winter; now only very hardy varieties are exempt. Wheat was for many years a staple and profitable crop. More recently, among other difficulties, it is occasionally bare of snow, when it is usually winter-killed.

3. The river Rouge, passing through the town of Plymouth, takes its rise in the next town west, Salem. Originally it was copious enough to afford power to operate six saw-mills, and four grist or flouring mills. At present only three saw-mills are supplied with power and during but a part of the season, while two grist mills remain, and at least one of these is supplemented by a steam engine. Many springs have either wholly disappeared or only afford water during wet weather.

4. The percentage of timber now remaining can only be accurately arrived at by an actual census. In the absence of this I estimate the amount at probably ten per cent.; which is quite possibly excessive.

5. I think timbered lands are pastured in the majority of cases, with the result that waste and decay are not being replaced with new growths; so that, with the continuance of this practice, the land will become deforested with the maturity of the present growth of timber.

6. There has for several years been a dearth of timber in the town; and reforestation is already felt by many persons to be a pressing need. Very little has, however, been done in this direction.

7. I would encourage the preservation or replanting of timber by exempting from taxation a strip, six rods wide, along the west or north sides of each eighty acres, when saved from the original forest or densely replanted, and preserved against fires and the browsing of stock.

Also make it a penal offense to set, either intentionally or accidentally, fires which shall damage adjacent property.

Also exempt from taxation, say for the first six or more years, any and all lands planted for the purpose of growing timber, specifying varieties to be planted, distances apart, and treatment to be required—also requiring the exclusion of farm stock.

Require, under sufficient penalty, that persons, whether farmers or lumbermen, in cutting timber, leave the debris, is the best possible condition to prevent the spread of fire.

Require all railroad companies to take effective measures, by the use of spark-arresters as well as by a vigilant police, in case of dry or windy weather, to prevent the setting and spread of fires along their tracks.

FROM GEO. D. MOORE, MEDINA, MICHIGAN.

1. The tendency seems to be for winter weather to continue later into the spring months, and for autumn weather to continue much later than formerly.

2. Orchard crops are much less certain, as well as wheat and clover.

3. I cannot give definite dates, but know of several brooks and springs that used to flow for the entire year that are now dry a good portion of the time.

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4. About fifteen per cent. Heavy timber.

5. It is the general practice to pasture wood lots. Much of the large timber is dying and there is but little undergrowth.

6. I think not more than the planting of belts for windbreaks.

7. I think it would be difficult in this country, even though in some cases benefits might arise by limited reforestation.

FROM W. K. SEXTON, HOWELL, MICH.

Prof. W. J. Beal,—Dear Sir:

Replying to your circular letter on deforestation, I will say:

1. Deforestation is causing drouth, less rainfall and heavier and more frequent winds. Severe winters are more frequent than formerly.

2. Deforestation has cauzed more frequent freezing of winter wheat and almost an entire failure of the peach crop.

3. Deforestation has caused the failure of many springs and shallow wells, necessitating deeper digging for water. This may be considered to a great extent an advantage.

4. About ten per cent; mostly light.

5. It is customary to pasture timber lots.. I consider it no injury to the trees and but little benefit to the stock, except in the way of shade. I think stock should be provided with shade in every field. I have known stock to be afflicted with sunstroke

6. Reforestation in this locality is not of great necessity yet, but the saving of trees in wasted places, in fields for shade and roadside planting should be encouraged.

7. I would favor the effectual carrying out of the present law in regard to planting trees by the roadside, but would not favor legislation that should tax the people for reforestation.

FROM PROF. V. M. SPALDING, ANN ARBOR, MICH.

1. I am not aware of any climatic changes in this section that have resulted from deforestation.

2. No changes in farm, garden or orchard crops have resulted here from deforestation *as far as my own observation goes.*

3. *None* have come under my *direct observation.* There are abundant examples of such changes, however, that are perfectly well attested. Our tamarack swamps become much more dry when the trees are cut off.

4. I have not the data for answering fully. This region is largely "oak openings," but on different kinds of soil in the townships adjacent to Ann Arbor heavy timber, including, maple elm, ash, whitewood, basswood, oak, hickory, etc., occurs.

5. Pasturing timber lots has been practiced to a considerable extent in this township. The results have not been manifestly injurious.

6. There is no reason for supposing that if the poor land that is badly tilled were reforested it would be a profitable investment of capital and enhance greatly the value of the farms on which it might be undertaken.

7. I do not yet feel settled as to the best form of legislation. I regard the establishment of a Forestry Commission an important step. If this commission is given full opportunity for making the necessary observations and

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these are widely published, the great body of information thus disseminated will aid greatly in creating a proper public sentiment, and in inducing corporations and individual proprietors to preserve existing timber growths and to encourage planting.

Some steps ought by all means to be taken towards establishing a few experimental stations, in an inexpensive way, in this and two or three other localities in the State, in order to determine by direct experiment what may be expected of different species of trees under different conditions.

I regret that I am unable to answer as fully as is desirable, but am forced to write in this incomplete way or else defer an answer an indefinite time.

FROM B. W. STEERE, ADRIAN, MICHIGAN.

1. Heavy and destructive winds more frequent and severe. Drouths more frequent and of longer continuance. Heat of summer and cold of winter often more intense. Another change I have been watching is that in the *direction* of our winter winds. We always used to look for and expect southwest winds in the coldest weather. As late as the "cold New Year" of 1864 the wind was southwest by south, blowing the snow almost horizontally for days, with the cold intense. Now, as in many other States, the coldest weather accompanies a west or northwest wind. A corresponding change seems to have taken place in the opposite undercurrents that often precede a storm, which instead of being east or northeast are now often from southeast. I do not pretend to account for all this by *local* deforestation, but may not the destruction of extensive pine forests, far to the west, northwest, or north, have had something to do with it?

2. Portions of our country are so open that wheat and clover are sometimes nearly ruined by the snow being blown from the fields, except perhaps on the west side, where fences and roadside trees caused drifts and partial protection. In such windy localities many fruit trees lean toward the northeast, owing to southwest winds in the growing season. The upper or southwest side is pretty sure to become diseased. May not the greater heat and cold of recent years, alluded to above, be credited with much of the present unhealthy condition of some of our orchards? Perhaps high winds are becoming more common in autumn, also, like that of October, 1886, when so many of the finest apples and late pears were dashed to the ground, and those of the more delicate kinds, like Bellflower, remaining on the trees were so battered by each other and adjacent limbs as to be nearly worthless.

3. More wells have had to be deepened in the last four or five years than in all the years preceding. It is well known that springs dry up where the timber is destroyed, and, as a matter of course, brooks and rivers suffer also.

4. I cannot give the per cent., as in some of the older portions scarcely any of the timber is left, while newer parts may still have from two to ten, and a few as high as twenty or more acres to the farm. Timber mostly heavy.

5. It is common to pasture timber lots. Where the timber has been thinned enough for the blue grass to come in, it suffers more or less, depening somewhat on kinds, perhaps beech the most.

6. However desirable it might be, it is impossible when a man values a bushel of wheat or corn above the most beautiful tree.

7. I suppose the only legislation practicable at present, would be in

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reference to roadside planting, as continuous rows of trees on both sides of all highways would be a great protection, and perhaps ameliorate the climate somewhat, with but little loss of land. Therefore, I would recommend a very stringent law, with heavy penalties, requiring all land owners to plant such rows, within a given time, the trees to be not less than thirty feet nor more than sixty feet apart; with a fine of $25 for failure to plant, and $10 for each tree cut down, whether transplanted or native, provided the space left between the remaining trees is more than sixty feet; this explains the reason for fixing the minimum at thirty feet, as every alternate tree could finally be cut down without violating the law. It should be made the duty of the overseer of highways, or some other officer, to notify all land owners of the law within a given time of his election, also to prosecute, collect fines, etc., in *every* case of violation; himself to be fined, not less than twenty nor more than fifty dollars for each failure of duty,—the money in both cases to go to benefit the district. The osage orange hedge, in addition to its ragged and unsightly appearance, and its many other objectionable features, is of late also contending for the right of way with our fine old shade trees; and the farmers, finding it does not flourish under them, are cutting them down. It is a sad fact that, for this cause and quite a common lack of a proper appreciation of the use and beauty of the trees, hundreds are being annually destroyed, and if not soon checked the very neighborhoods most needing them will be destitute.

Dear sir, you can see by what has been said above, that the present law regarding highway planting is inoperative with us. Some of the causse appear in my reply to question seven, but the most potent is that, for good reasons, neighbors will not complain of nor prosecute one another. So it becomes a *positive necessity* to make it the *duty* of some one, under *heavy* penalty, in which case he will not incur the dislike of friends.

Perhaps a higher officer than I indicated, as road commissioner or even one for the whole country, to have a general oversight, also to know to a certainty that those below him do their duty.

Another cause of failure is the prevailing ignorance of the existence of our present law. I discovered this in efforts to save certain fine old trees, some of which stand to-day, one partly cut down. One quite intelligent man was surprised to find that he might not cut trees on land for which he had paid; but being a good christian he abstained from breaking the law. I think he is glad now that he did and that he loves those grand old natives the better for it.

Some such highway law as indicated need not, and I think would not interefere with reforestation where most needed, as in the thin soils of the pine districts. Such a law, if strictly enforced, would be likely to have an educating influence; the value and beauty of trees would become a more common topic of conversation; and in time men would as soon think of killing their best cow for the hide as cutting some grand old oak, in a conspicuous position, for a few posts or a little firewood, of which I have known a number of instances.

Should not the Agricultural College and State Horticultural society take up the osage hedge nuisance?

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REPLIES FROM MEN IN THE NORTHERN COUNTIES IN ANSWER TO QUESTIONS SENT THEM.

List of Questions.

The following list of questions was sent to residents of some of the northern counties of the State:

1. What per cent of land in your vicinity is heavily timbered? Lightly timbered? Barren?
2. Estimate the damage done by forest fires in your locality during 1887.
3. Name the kinds of property in the order of loss sustained.
4. State the causes of fires.
5. What means, if any, are used most effectually to check or prevent forest fires?
6. In what ways is timber wasted in clearing?
7. Give instances from your experience or observation of any climatic change due, as you suppose, to deforestation in your section?
8. Does your county or vicinity need any forestry legislation? If so, what? And what measures would you advise?

To these questions the following replies were received:

FROM A. S. KEDZIE, GRAND HAVEN, MICH.

Prof. W. J. Beal:

In reply to your recent inquiries in order:

1. Lands in this county bearing timber were all heavily timbered, both hardwood and pine. Excepting some 5,000 acres the original heavy timber has been cut off, leaving now some 6,000 acres of original, low marshy prairie, cleared farms and the remainder with a heavy body of undergrowth.
2. Both between this city and Muskegon on the north and Holland on the south considerable damage was done by the fires of 1887. I have no means of telling how much, but many acres were burned over.
3. The property thereby destroyed was chiefly second-growth timber.
4. Carelessness in clearing land. Possibly sparks from locomotives may have been one cause, but this I do not positively know; nor have I reason to think that fires were started by careless hunters. Some may have been.
5. The fires south of this city were fought by denuding the soil of combustible material in advance of the fire. This was done by those whose property was endangered, and by others caring for them.
6. Timber has become too valuable to be wasted in clearing land. What cannot be used in manufactures or in fencing is cut for firewood.
7. Have made no observation of climatic changes by deforestation.
8. Legislation would be in place holding men to stricter account for letting fire get beyond control; for wanton carelessness in allowing fires to get started in the forest. Especially should railroads be held accountable for starting fires, either by their careless men or by their engines.

FROM J. H. MOORES, LANSING, MICHIGAN.

Prof. W. J. Beal, Agricultural College, Michigan:

DEAR SIR,—I make the following answers to your forestry questions, which apply to town 24 N., 6 W., Missaukee county, viz:

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1. Heavily timbered hardwood 50 per cent.; cleared farms, 1-6; pine, 1-12; pine choppings, 3-12. No actual barrens.
2. Very little.
3. Mostly hemlock timber, which is more easily killed by fire than any other.
4. Settlers clearing, mostly.
5. None. Wait for the Lord to send rain.
6. Finest of maple, elm, etc., are burned up in heaps, as there is no market for the wood or lumber, and must have the soil to get a living from.
7. Remember none, except increased cold winds of winter, and consequent drifting of snow when timber is removed.
8. It would be impossible, or at least not practicable, to enforce a law against settlers burning their fallows in dry times.

FROM GEO. C. NEVINS, PRINCIPAL OF SCHOOLS, CHEBOYGAN, MICHIGAN.

1. Of the unimproved land about fifty per cent are heavily timbered, thirty per cent. lightly, and twenty per cent. are barrens.
2. Estimated at forty thousand dollars. Each of two firms reports a loss of ten thousand dollars on standing timber and logs on rollways.
3. Standing pine, logs, cedar, cordwood and stovewood and buildings.
4. Probably settlers' clearings start the greatest number, but these are in "timbered lands" or hardwood, and are not so extensive or disastrous as fires in pine or cedar timber. Hunters, landlookers, and berry pickers, both white and Indian, start many fires in pine, and it is a question whether fires started by settlers do as much damage as those started by these latter named causes.
5. "Backfires" are used to protect particular pieces of property, but no effort systematically is made to check or prevent fires. The individual protects himself the best he can.
6. Hardwood timber is burned in clearing and large quantities of fine timber are thus destroyed.
7. We do not think that deforestation has yet been extensive enough in this vicinity to influence the climate.
8. Legislation will be of very little value in the newest counties. Settlers feel the burden of their timber, land is cheap, and we cannot *prove* criminal carelessness in the origin of fires.

FROM HON. JOHN T. RICH, COMMISSIONER OF RAILROADS, ELBA, LAPEER CO., MICH.

Prof. W. J Beal, Lansing, Mich.:—DEAR SIR:—In replying to questions in regard to forestry contained in yours of recent date it is doubtful if I can give any information which will be of value to the cause of forestry, as in the locality in which I live there are no forests left except what each farmer has saved for his own use, and which are very seldom damaged by fire.

1. Probably 12 to 15 per cent of the land is still covered by the original forest, which was maple, beach, basswood, ironwood, elm, and ash interspersed with white and red oak. The oak is nearly gone, owing to the fact that it dies and decays since the land generally was cleared. It seems to be old and has ceased to grow.

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2. There was very little damage done by forest fires proper. Considerable fence was burned, but the fires usually did not originate in or get into the small patches of woods which constitute the forests in this locality.

3. Fences and pastures.

4. Locomotives and threshing engines.

5. Where fenced in and occupied by owner it is seldom that fires occur. When they do occur, a furrow plowed ahead of the fire will often prevent its advance. If not practicable to plow, dirt shoveled on to and in front of the fire has proved effective to prevent its spread.

6. In the early days of the settlement of the country timber was burned or felled and allowed to decay. Often the small timber was cut and burned and the large timber girdled; any way to get rid of it. There is no particular waste of timber at present.

7. Early and late frosts to the injury of vegetation are much less frequent than formerly. Perhaps drainage has had something to do with this as well as the removal of the forests. Floods are more sudden and severe and of shorter duration than formerly. The fountain heads of wells and springs are growing lower. There is no appreciable difference in the amount of rainfall. The most severe drouth I have ever experienced was in 1850 or 1851, and the most disastrous rainfall was during the harvest of 1882.

8. I know of no legislation which would have any beneficial effect in preserving the remaining forests, unless it be to require woodland to be fenced against all kinds of domestic stock. When stock are permitted to run in the woods they prevent the growth of young timber by eating, treading down, and by causing grass to grow, which is destructive to all timber. Then the rubbing against the trees and treading around the roots kills much timber.

When your last question is read it leads to the opinion that in alluding to locality or vicinity you would include perhaps a whole county. If so, in Lapeer county, in addition to what has been said, there was formerly in the south and southwestern portion of the county, some oak openings, of which there is about the same percentage left as of the heavy timbered land. Much of the north half of the county was covered with a heavy growth of white pine which is almost entirely gone, and a very large portion of it is now settled, the stumps are being removed and good farms made. The loss by fire in this portion of the county has been larger than in the older settled portion, and many of the fires originated in burning log and stump piles. The losses have in some instances included, in addition to fences and pasture, buildings and stacks of hay and grain; but the loss sustained I have no means of ascertaining.

WHAT HAS BEEN DONE IN OTHER STATES?

[BY W. J. B.]

A brief statement concerning the condition of forestry work in other States, as to when it was begun, what kind of work has been done, the expense involved, and the effects if any. It is taken mainly from the last report of the Division of Forestry, by B. E. Fernow, chief of the Division. The arrangement of States is made geographically, as in the report referred to.

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MAINE.

About sixty-two per cent of the area is still wooded, and it is the opinion of many lumbermen that it is increasing. As early as 1855 an act was passed "to protect forest and timber land from fire." Arbor day was appointed by the governor in 1887 to encourage planting for shade and ornament.

"The immense forests in which the large rivers of the State find their sources were originally worked for pine. A more sensible and economical management has taken the place of the former wasteful methods. This consists mainly in keeping out fires and in not allowing trees below a certain size to be cut, a condition which enters into the land holder's leases to the loggers. The owners of the wild timber lands, whose holdings are in large tracts, often comprising one or more townships, clear no land and sell no land. In southern counties the young pine is now springing up freely in abundance. Farming land is carefully protected."

NEW HAMPSHIRE.

This State has fifty-two per cent of its area in forest. No legislation of pratical service exists. A commission was appointed in 1881 to report upon the condition and needs of forestry. It presented a valuable report, full of practical, conservative recommendations, but no action has followed this report. Laws exist for the purpose of preventing forest fires, but it is said to be doubtful if they have had any effect. The duty of enforcing the law is not imposed upon any particular officer.

MASSACHUSETTS.

Within the last five years considerable attention has been given to forest legislation, imposing heavy fines for willfully or recklessly setting fires that may do injury to timber or other property. Fire wardens are appointed to enforce the provisions of these laws. Any township or city may set apart or purchase land to be devoted to the "preservation, reproduction and culture of forest trees, either for sake of the timber or the preservation of the water supply. Some plantations, made with a view to financial returns or as a protection against winds, are reported from various parts of the State"

The State Board of Agriculture is constituted a board of forestry, and shall supervise all such public domains, and shall make all necessary regulations for their care and use. All revenue, if any results from any reserve, shall be used so far as needed in improving the reserve, and any remaining shall be paid over to the city or town to which the reserve belongs. Arbor day is established, and plantations of certain specified timber trees are exempt from taxation, provided the number is not less than 2,000 to the acre; that the land shall not have been "sprout land," nor that it shall have a value exceeding $15 per acre. The exemption is to continue for ten years from the time the trees have attained a height of four feet. This law is thought to be without effect. Fruit or other trees growing for shade or ornament, are protected by law, under penalty of imprisonment or fine, for cutting or willful injury.

Instruction is given in forestry at the State Agricultural College, and the Mass. Society for Promoting Agriculture offers liberal prizes to encourage tree planting.

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CONNECTICUT.

This State, with twenty-one per cent forest area, in 1886 established Arbor day, and exempted plantations of designated timber trees from taxation for a period of twenty years, providing that land before planting was worth not more than twenty-five dollars per acre. A few lectures on forestry are given in the agricultural course at Yale.

VERMONT.

With thirty-two per cent forest area, "this is perhaps the only State that places a premium upon the removal of the forest, exempting the owners of migratory saw-mills from taxation upon their timber lands for five years." In 1882 a commission was appointed which reported in 1884, and made many good suggestions. No legislation followed, however. Under the existing laws malice and willfulness must be shown in order to secure redress for damage from fires.

NEW YORK.

After much agitation and a report of a temporary commission in 1884, a Forest Commission was created in 1885, for the purpose of managing wisely and upon conservative grounds the forest property of the State; $32,500 were appropriated for its use, under certain limitations.

The commission took in charge the Adirondack forest reserve, and report almost absolute immunity from fires, as well as a complete arrest of timber thieving and the recovery of $14,000 for trespass, and for timber illegally cut. The State owns 715,000 acres, and the effects of the work of the commission have been so marked that government lands have advanced many times in price.

The officers of the forest administration are three commissioners without salary, a secretary, a warden, an assistant warden, two inspectors, and fifteen foresters, with a monthly pay roll of $1,375.

So long ago as 1876 the statutes contained provisions which, carried out, would have prevented many forest fires, and extensive legislation in regard to the matter of shade trees, forests, and forest fires, existed before the commission was established. With that, however, came additional fire legislation, and each town was divided into fire districts. The commission makes and posts rules for the prevention and suppression of fires.

Mr. A. L. Train, secretary of the commission, says: "Our fire laws are good. * * * Legislation is needed in the direction of perfecting the means of putting the laws in force."

The commission aims at educating the people by the publication of tracts, circulars, etc.

PENNSYLVANIA.

Good fire laws for a few counties have existed since 1870. At the instance of one man, they were enforced in one tract of mountain forest. The legislature of 1887 passed laws looking to the encouragement of tree planting, and to the protection of forests. The first object, the preservation of forest areas, is to be attained by a rebate of taxes on planted or cared-for natural timber lands; but, as it does not result in a saving of more than from 25 to 45 cents per acre, it is little encouragement.

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A law exists allowing reduction of taxes for tree planting along highways, and is reported as a bad thing, the shade being a damage to the roads (because proper road making and drainage are not provided). A State Forestry Commission has been formed, Arbor day inaugurated, and the work begun.

NEW JERSEY.

In spite of apparently good fire laws existing since 1792, about $1,000,000 loss per year is reported from forest fires. Arbor day was established in 1884. This State has extensive sandy plains bearing scrub pine, much like our jack-pine plains.

MARYLAND.

Nothing done for forestry except passing laws for "malicious firing of woods." This will apply to most of the southern States.

WISCONSIN.

This State allows a bounty of two dollars per acre for tree planting, after the trees are twelve feet high. Before that time, lands planted to trees may be exempt from taxation.

There is much loss of timber from fires, although the State has a law to punish offenders.

MINNESOTA.

An act was passed in 1871 to encourage planting and growing of timber and shade trees. Arbor day was instituted by the State Forestry Association in 1876, and legalized by the legislature of 1881, which also appropriated $5,000 to the society to enable it to publish its manual of tree planting. It is estimated there are now between 50,000 and 60,000 acres of planted forest in the State.

OHIO.

The American Forestry Congress was formed in Cincinnati in 1882. A State Forestry Bureau was created in 1885, consisting of three unpaid commissioners. They have as a part of their duties the establishing of a forestry station on the University grounds; $1,000 are appropriated annually to pay necessary expenses.

ILLINOIS.

The law of 1874, offering a bounty of $10 per acre to any one planting forest trees and cultivating them for three years, seems to have had no effect.

ARKANSAS.

"To get rid of the timber" is the only forestry interest reported.

IOWA.

This was one of the first States to teach forestry, and much has been done by the Agricultural College in testing both fruit and forest trees. It early adopted an Arbor day, and as early as 1874 offered twenty-one distinct

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premiums for tree planting on that day. The school law compels the setting and protection of twelve or more shade trees on all school grounds where that number is not already growing.

DAKOTA.

Territorial laws offer an annual bounty of $2 for ten years to any one planting and cultivating one or more acres for three years. If five acres are cultivated and set with trees, the quarter section on which it is situated and all improvements up to $1,000 are exempt from taxation for ten years.

NEBRASKA.

As in most prairie States the public responds readily to the provisions of Arbor day, and the State agricultural society offers three premiums annually for the largest number of trees and cuttings planted on Arbor day. It is said that 1,000,000 acres have been planted to trees in this State.

KANSAS.

The planting has been vigorously prosecuted and with results similar to those in Nebraska. Arbor day has been observed with much interest since 1875. Early in the last year an act was passed by the legislature of Kansas establishing the office of commissioner of forestry, and providing for two experiment stations, (farms of 160 acres each) to be under the management of that officer, for the purpose of growing, testing, and distributing to those applying for them, trees suitable to the soil and climate of Kansas. The Horticultural society of this State is distinguished for the attention it gives to the subject of forestry, and its annual reports abound in valuable information upon this subject.

COLORADO.

This is the only State whose constitution mentions the matter of forestry needs. Not until 1885 was any more made, but then the officer of State forest commissioner was created, and county commissioners and road overseers were made forest officers. Little has been done.

CALIFORNIA.

Within a few years the people of this State have awakened to a desire to preserve their forests from wanton destruction, and have taken active steps in forestry matters. A State board of forestry was established in 1885, and the three men appointed have entered upon a wide range of duties of a practical nature. Good results are hoped for. Six forest experiment stations have been established in different parts of the State. "Experiments have been made looking to the introduction of some valuable trees not indigenous to the State." The commission will ask for more power in carrying out their work, and will especially urge legislation looking to the better controlling of forest fires.

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NOTES FROM GARDEN AND FOREST.

AMERICANS AS A RULE GIVE LITTLE STUDY TO FORESTS.

"Americans are still surprisingly ignorant in regard to their forests and the simplest laws which should govern their management. This indifference is astonishing. We cut recklessly and often needlessly; and often fail to cut when cutting is essential. Fires are allowed to run unchecked year after year through the forest, or to sweep over land upon which new forests would naturally appear. Cattle and other domestic animals range at will through the woods, injuring trees and exterminating seedlings. Our civilzation and our foresight as shown in the care of our forests, is the civilization and the thrift of France two centuries ago. In no other civilized nation of the world are forests so recklessly managed.

"Americans are impatient of any restraint or interference in the management of their property. And yet, unless American land owners, like the land owners of nearly every other civilized people—Great Britain now being the only important exception—are willing to submit to laws, regulating under proper official control the cutting of their forests and the use of their land for agriculture or forest, according to its quality, we must not expect to keep our forest supplies. These supplies are still enormous, but no forests, whatever their extent or richness, are inexhaustible. As one of the wisest observers of all social problems, and one familiar, too, with the requirements of the forest, has pointed out, the condition of public sentiment required to make a proper management of our forests possible, will develop slowly. Americans as a nation need instruction in the laws which govern forest growth and forest management. This lesson they will not learn readily or quickly, and it is probable that they will not learn it thoroughly until compelled to by dire necessity."—*Garden and Forest, Vol. 1, p. 25.*

THE IMPORTANCE OF STUDYING AND CARING FOR FORESTS.

"No system of agriculture can be long successful and profitable which ignores the necessity of cultivating trees, and which does not recognize the fact that much land in every country can only be made profitable by means of trees. The precepts which should be often repeated to farmers are not that trees produce rain or that trees are sacred objects which can not be cut without offense to man and nature. The lessons they must learn, if they hope to compete with the farmers trained under more enlightened systems of agriculture, are that sterile, rocky, hilly ground cannot long be tilled profitably, and that such land can only be wisely used to produce trees; that the pasturage of domestic animals in woods, or on land only suitable for the growth of trees, is an expensive and wasteful system, as unsatisfactory from a pastoral point of view as it is fatal to the forest; that trees are as much out of place in the strong, level lands, really suitable to permanent tillage as cattle are out of place in the woods. And they must learn, too, that woodlands can only be made profitable when the same care is given to the selection of trees with reference to soil and climate as is bestowed upon the selection of grain and other crops, and the rules which nature has established for the perpetuation of forests must be studied and obeyed."—*Garden and Forest, Vol. 1, p. 229.*

THE VALUE OF A GENERAL KNOWLEDGE OF FORESTRY.

"All over our land we are losing millions by ignorance and carelessness on the subject of forest fires. The people do not realize it at all, especially in our western States and Territories. In Oregon, Washington Territory, Montana and Idaho, among the firs and yellow pines, the fires are doing the most damage. I have seen millions of acres made bare by fires that were the result of carelessness along the railways in Washington Territory and Idaho. The very fact that a government forester was ranging in the forests about Puget sound, the Columbia and Williamette rivers, would have a good influence in every lumber camp and along every railroad. I have seen one burning started by a gang of railroad workmen in Washington Territory that destroyed over one million dollars worth of timber. This fire would never have occurred if such carelessness had been made criminal by law, and if an officer of the government had been within reach to enforce it. There is no question but that if $250,000 a year even were properly spent in care of forests and forest education, it would add millions to future values."—*H. C. Putnam in Garden and Forest, Vol. 1, p. 298.*

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SELECTING TREES FOR PLANTING IN AMERICA.

"The nature of the soil and the character of the native vegetation should primarily determine his choice which may depend secondarily, however, upon the purposes to which his forest crop is to be applied, and upon probable future local demands for timber. In European countries where the number of species of trees growing naturally is very small, the scientific forester is rarely compelled to occupy himself with forests composed more than two different deciduous trees, the oak and the beech, but in America forests when sometimes twenty or thirty species of more or less valuable trees are closely associated together in small areas, the difficulties of forest management are greatly increased, and we have still to learn how a mixed forest of many species can be most profitably worked. At present, at least, the owner must select the most valuable species among those which grow the most freely on his ground, and then, the crop being decided upon, devote himself to the development and the succession of the individuals of those species."—*Garden and Forest, Vol. 1, p. 334.*

"A forest of deciduous trees, especially in this country where a large number of different species are almost universally associated together, is more difficult to manage than one composed of conifers, which usually grow gregariously, and are, moreover, little dependent upon artificial thinning and pruning. The operations of scientific forestry are all directed to the perpetuation of the forest. They are based on the principle that trees can be grown on certain land more profitably than any crop, and that, this fact being established, rural economy demands that the forest should be a permanent fixture on such land."—*Garden and Forest, Vol 1, p. 333.*

A SATISFACTORY FOREST.

"There should be in a perfectly healthy and satisfactory forest three stories of vegetation, so to speak. First, a growth of tall trees near enough together to insure the development of tall, straight stems, without low branches, which destroy their value for timber; but not so near that their heads exclude all light from the forest floor, and so prevent the growth among them of other plants; 2d, a crop of younger trees growing under and among the last, either of the same species or of some valuable species capable of supporting shade, and which will replace the older trees when these reach maturity; and 3d, a growth of low undershrubs and seedling trees covering the forest floor, holding the leaves which fall from above, and containing the material for future forests. The task of converting the most neglected and unpromising piece of woods into a forest of this character is not difficult in this climate. It requires only a short time comparatively, but it can not be done without labor, and without careful study of trees, their nature and requirements."—*Garden and Forest, Vol. 1, p. 334.*

HOW TO TELL THE CONDITION OF A TREE.

"The condition of a tree can be roughly decided by an examination of its top. When the upper branches begin to fail, it is a sign that it is no longer in a healthy condition or capable of producing much more material. A tree in scientific forestry is considered ripe and ready for the axe when the bulk of its annual increase of wood diminishes or does not increase."—*Garden and Forest, Vol. 1, p. 334.*

MANAGEMENT OF FORESTS.

"In no branch of agriculture, perhaps, do the people of the United States so need instruction now as in all matters relating to the care and improvement of the woods and woodlands connected with farms. It is almost a universal custom with American farmers to neglect this part of their property, and to be satisfied if the woodlot furnishes a little pasturage, and a scanty supply of half rotten or worm-eaten wood for the kitchen stove.

"It is generally admitted that forests ought not to be pastured. * * * The first requisite in forest life is to keep the ground fully shaded, so much so that grass cannot grow, to keep it moist and free from packing or the tracking of cattle, and to encourage such a growth that drying winds may not enter."—*Garden and Forest, Vol. 1, p. 310.*

"Occasionally some uninstructed person speaks of inexhaustible forests, but by this time it should be pretty generally understood that a forest can be made to yield indefinitely only by restricting its average annual production to its annual increase.

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The forest products of Maine, for example, diminished alarmingly after the white pine and spruce in that State had been recklessly destroyed for many years and the entire extinction of its most important industry was threatened. But the people of Maine have learned a dearly bought lesson, and realize now that forests can be destroyed, even though they may have appeared inexhaustible, during the lives of one or two generations of men. The Maine forests are not managed in accordance with the rules of scientific forestry as these are understood in European countries, and beyond question the practice could be improved upon. Nevertheless, this practice is based upon the laws of nature and the necessities which arise from existing conditions, and it is upon these that any system of forest management, however elaborately its details may be worked out, must rest primarily. The Maine lumberman has learned that excessive and unrestrained cutting, supplemented by fire, will destroy any forest, and that a forest from which only the ripe trees are cut at stated periods, while the remainder are carefully protected and allowed in their turn to reach maturity, will continue to produce indefinitely, and to pay handsomer returns in the long run than it would under the usual American custom of indiscriminate cutting without regard to future production. The changes which have been gradually taking place for a number of years in the management of the Maine forests have already borne fruit in their improved condition and increased output. They restore to the Pine Tree State its position as one of the most important of the lumber producing States, not in the actual product of the mills to-day, but in the promise afforded by more intelligent forest management of a steady and constant supply of logs in the future. If the present ruinous practice continues to prevail in Michigan, in Wisconsin and Minnesota, it will not be many years before the annual timber crop of those three great States will fall below that of Maine, and perhaps of some of the other New England States. It is not easy to overstate the importance of the system of forest management which is now being worked out in the Maine woods, and which is the more likely to succeed because it is based upon experience. Its eventual success means prosperity for the State; its failure, practical ruin for a large part of it. Other States can learn much from Maine: and especially that by the patient application of a few sensible rules, rules which nature herself teaches, and by the use of a little forethought and a little common sense, a forest can be made more surely and prematurely productive than property of any other description."—*Garden and Forest, Vol. 1, p. 278.*

AMERICAN FORESTS REQUIRE DIFFERENT MANAGEMENT FROM THOSE IN EUROPE.

"The study of European methods and results in forestry by competent men is, of course, highly valuable, but it is not enough. It is not even the most important thing for us. Nothing can be very useful to us which is not based upon careful study of the facts and conditions which are peculiar to this country. We should have in time a system of American forestry—we must have it, indeed, if we are to avoid serious disasters to our national interests and civilization. We cannot import and adopt ready-made European systems or methods. The forestry of this country must be the product of growth, which has as yet scarcely begun. It will be developed by continued and widespread observation, and by constant comparison of the results of practice. It is necessary to remind ourselves that no useful system of forest management can be originated or created by legislative enactment. There must be considerable special knowledge and considerable national good sense regarding the needs of this country, behind forestry laws, or they will be not only useless, but mischievous."—*Garden and Forest, Vol. 1, p. 26.*

DISADVANTAGES OF COPPICE-WOODS.

"Coppice-woods, that is woods composed largely of suckers, or the growth from the stumps of trees previously cut, it being the custom in some parts of the country, especially in New England, to cut a piece of woods clean, leaving the old stumps to furnish a fresh supply of trees. The disadvantages of this system are, that stump shoots never make as long-lived or valuable trees as seedlings; that as each old stump produces several shoots, these are crowded together so that no one of them is able to grow into a good tree; that some species of trees produce shoots from the stump more freely and more vigorously than others, so that if left to themselves these species must eventually occupy the ground, to the exclusion of all others, and that, as stump land loses its power to produce shoots after two or three crops have been taken from it, a wood treated continually in this way must either disappear eventually or change the character of its composition." * * * —*Garden and Forest.*

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WILL IT PAY TO CLEAN UP THE RUBBISH AFTER CUTTING SOME OF THE BEST TREES?

"The fact that the tops of the pine and spruce trees cut in the Maine woods can be utilized in the manufacture of paper-pulp, has more than local or mere industrial significance. The fires which do such immense injury in the coniferous forests of this country can generally be traced to the tops and branches of trees, left by the lumbermen behind them in the woods. These by the middle of the following summer become perfectly dry and afford the best material to start a fire with, in case a careless hunter or tramp or berry picker drops a lighted match or a spark from his pipe into it. In Europe there is a demand always for such minor products of the forest; and the material itself pays for gathering up every part of the tree which the lumbermen cannot make use of, to say nothing of the increased safety this gives to the forest, and to the priceless surface coating of decaying vegetable mould which fires consume. No one in this country has wanted the tops and branches of trees, and lumbermen have preferred to take the chance of almost inevitable fire rather than paying the cost of having the woods cleaned up behind their operations. The upper part of the main trunk as well as all the branches and chips and all unsound logs, the whole amounting generally to a third of the whole bulk of the tree, has been left in the woods to burn or rot; while in the case of hemlock it is only within a comparatively recent time that any use of the tree except the bark has paid. In some districts in Maine now, however, the tops and larger branches of the trees are gathered; and the wood from which the knots and sap wood is first removed, is thoroughly steamed to extract all resinous matter and then ground into dry pulp. If it is profitable in Maine to do this, it will doubtless prove profitable in other parts of the country; and one of the principal causes of forest fires may perhaps in time be eliminated in this way."—*Garden and Forest, Vol. 1, p. 290.*

A FOREST PRESERVE IN CANADA.

"A movement has been started to induce the Canadian government to establish a forest preserve about the head waters of the Muskoka river which flow into Lake Huron, and of several of the important streams which feed the Ottawa, and which rise in the same region, Island Lake, the head of the Muskoka, being not more than a half a mile distant from Otter Slide Lake, from which springs the Petewawa, a feeder of the Ottawa. This is a picturesque and well wooded country, abounding in lakes and streams and swamps, and still frequented by game and game fish; it is, moreover, one of the most important in Ontario as a natural reservoir. The proposed reservation embraces a territory of 330,000 acres, exclusive of an area of about 60,000 acres more of water. What the promoters of the scheme desire is that the government should create a public forest and define its boundaries; and appoint a forester and assistants to take charge of it; and cut the timber as soon as it is ripe under proper rules and regulations. There can be no doubt that the preservation of a great forest area at the head-waters of such important streams would be immensely advantageous and profitable investment for the Canadian government, not only in the influence it would exert upon the water supply, but in increased and permanent lumber crops, which good management would insure. This is a matter which should appeal to all Canadians interested in the development of their country, and one which the people of the United States will watch with interest, as an example of what must be attempted in this country if our forests and streams are to escape the extermination which now threatens them on every side. It is proposed that the Ontario reserve shall be known as the Algonkin forest."—*Garden and Forest, Vol. 1, p. 319.*

THE PITCH PINE ON THE SANDS OF NEW JERSEY.

"The pitch pine is not one of the most valuable pine trees of the United States. Its wood is coarse grained, full of resin and not very strong. It is in every way inferior to the wood of the southern long-leafed pine, which it resembles in structure and general appearance, but which it will never replace as long as the southern pine forests continue to yield as freely as they do at present. But the time will come, perhaps, when New Jersey pitch pine will play an important rôle in supplying the people of the United States with timber. The southern pine cannot last forever, under the existing management of these forests, and the species which is everywhere replacing it, the old field or loblolly pine (*P. Tæda*) is inferior to the northern pitch pine in the quality of timber it produces. Before southern pine was brought to this market the pitch pine of New

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Jersey was the only available timber in many parts of the State for timbers and flooring; and there are still houses in some counties where floors and floor-timbers are known to have been in constant use for more than a century. But it is for firewood and for charcoal that the pitch pine is most valuable; and the nearness and accessibility of these New Jersey pine forests to great centres of population give them special importance as sources of fuel supply, which no other forests of this character in the country possess. Much land within three or four hours by rail of this city and of Philadelphia, now utterly unproductive and rapidly deteriorating through the fires which sweep over it every year, can be made highly productive and profitable by means of the pitch pine. People who own land of this character will see much to interest and instruct them in these Lakewood forests, and those in the town of Orleans, on Cape Cod, in Massachusetts."—*C. S. S. in Garden and Forest, Vol. 1, p. 166.*

RAILROADS VERSUS FORESTS.

"The building of railroads through a forest in this country means its extermination. This is particularly true of the Adirondack forest. Its escape from extermination in the past is due to the single fact that the hard woods of which it is principally composed could not be got to market from lack of transportation. If transportation is furnished it is merely a question of time when every tree will be consumed in the saw-mill, the paper factory and the charcoal furnace. Railroads will increase, too, the number of fires in the forest and thus hasten its extermination."—*Garden and Forest, Vol. 1, p. 49.*

CONCERNING THE AMOUNT OF TIMBER REMAINING IN NORTH AMERICA.

"If the lumbermen of the United States will take the ninth volume of the 10th Census reports and read the estimates and statistics on the standing timber of the United States and compare them with the amount of timber cut and sold in the past eight years, in connection with careful estimates being now made over the same ground in the timber States of Michigan, Wisconsin, Minnesota, California, Oregon, Pennsylvania and Maine, they will be convinced that time has proved our estimates to have been approximately correct. The careful examination of that census work, especially the object lessons presented by the maps of forest areas, will give, too, some knowledge on timber matters. In Wisconsin, for example, the estimate in 1880 of standing pine was some forty-one billion feet, board measure, of which fifteen billion was in the Chippewa valley. The eight years' cutting and the present amount of standing timber, estimated now at less than ten billion feet, show the 1880 estimate a fair one. * * *

"It is claimed that Michigan has less than thirty billion left, and the amount in Minnesota is probably about eight or ten billion feet. * * *

"To say that there is of the firs, cedars and other merchantable timbers in Washington Territory, Oregon and in the Pend d'Oreille Region of Idaho, five hundred billion feet would, I think, judging from an extensive examination made in 1882 and 1883, and from reliable sources, be low enough. That it will much exceed this estimate when cut, unless fires destroy it, is my belief."—*Garden and Forest, Vol 1, p. 297.*

VALUE OF FOREST PRODUCTS.

"When we thus consider the products of the forest it will not be a surprise to learn that these were estimated in the United States for the year 1880 at $800,000,000. The last government statistics at my command show some of our principal crops to have been:

Wheat	$474 291,850
Cotton	280,266,242
Gold and silver	74,400,000
Coal	94,500,000
Iron ore	20,470,000

"It will thus be seen that the economic value of our forest products is nearly double that of wheat, more than ten times that of gold and silver, and forty times that of iron ore. We are eating into our capital and providing for no renewal of it."—*Abbot Kinney in Garden and Forest, Vol. 1, p. 369.*

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WHERE LEGITIMATE TO USE MONEY.

"Professor E. J. James argues that it is quite as legitimate to expend Federal money to prevent the soil from flowing down mountain sides and filling up rivers as it is to expend money for clearing out their channels when once filled; and that it ought to be permissible to expend Federal money to protect the stream itself, if it be proper to stock and re-stock it with fish."—*Garden and Forest, Vol. I, p. 396.*

FOREST COMMISSIONS.

"The field of usefulness of these commissions is limited, and their work must be advisory and educational. They must become, if they are to justify their existence, the teachers of the people in all that relates to the forest. * * * * *

"As our advice has been asked, we shall be permitted, perhaps, to say that the forest commissions of the different States and their friends and all others interested in this country in the question of forest preservation, will accomplish nothing until they unite together in the adoption of some general scheme for educating the people of the United States in the questions relating to the forest. What is needed in this country now is such a discussion of the forest question, such an awakening of the intelligence of the American people to the importance of the forest, that it will be possible to secure (1) legislation from Congress, under which the forests upon the national domain may be administered for the good of the whole people of the United States for all time, and not for rings of contractors and timber thieves whose only interest is to cut every stick of timber, and then, after the forests are utterly ruined, abandon the land to hopeless worthlessness. Such an awakening is needed to secure (2) the enactment of laws in every State, under which forest property may be made secure from depredation and needless fires, and a condition of public intelligence which will make it possible, in the case of the forest, to subordinate private interest to the general good. But before this time comes the people of the country must learn that the welfare of the public is often dependent upon the forest of the individual, and that if the individual is allowed to do with it as he may wish, he endangers the community. The time probably will come when the farmers of the United States will realize that the pasturage of animals in their woods is not only an injury to themselves, personally, but to the whole community, and will consent to forego this privilege. * * * * But the mental development which will make intelligent legislation upon such subjects possible can only come after long years of discussion and education. In inaugurating such discussion and stimulating such education state forestry commissions will find their real and only field of usefulness, and failing in this they will show their unfitness for existence."—*Garden and Forest, Vol. I, p. 385.*

THE CANADA PLAN OF DEALING WITH FOREST FIRES.

"During the period from May first to October first, there is placed where forest is exposed to danger a man or men who are empowered and instructed to use every endeavor to prevent and suppress fires in every way possible, and the ranger is authorized to engage all the help necessary to cope with fire when prompt action is required. These men give information and distribute copies of the fire act.

"The government nominates the men. The number needed is left largely to the judgment of the people interested.

"As to the expense incident to the working of the plan, the government assumes one-half, the other half is borne by the limit holders. A trial of this plan was made in 1885, employing thirty-seven men. The effect was excellent and entirely satisfactory."—*Adapted from the United States Agricultural Report, Division of Forestry, p. 180, 1886.*

A STATE PARK.

There has been considerable said in favor of authorizing some persons in behalf of the State to select, purchase and look after a tract of 2-5 townships of land for a park or reserve. This should be at the source of some stream or streams, contain a variety of soils and timber and include swamps and lakes. The objects set forth are for studying the effect of such reserve

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on the sources of small streams; to afford an opportunity to study all kinds of wild plants in portions of virgin forests for many years to come; to encourage and protect, fish and wild game which is becoming scarce.

The suggestion has met with the hearty approval of all classes of people living in the northern part of the State and nearly all of the large number consulted in other portions of the State.

For aiding the advancement of science we feel certain that such a park would be a move in the right direction.

Associations of men have already begun to select portions of cheap land which they intend to maintain as a park and for the purpose of raising wild game.

The reader will recall the example the United States Government has set, by assigning a considerable portion of wild land in Wyoming and calling it "a national park." Canada has already done a similar thing. A note concerning the latter was quoted from Garden and Forest and appears elsewhere in this report.

RECOMMENDATIONS.

A difficult but very important duty is required by section 3 of the act providing for a forestry commission, viz., to recommend "such legislation as seems to them expedient to propose to preserve and restore the forest wealth of the State."

1. In view of the fact that supervisors are already burdened with the gathering of a multitude of statistics, and that the aggregate expense of securing the desired information by this method is large in proportion to the value of the matter gathered, we recommend that so much of the law creating the Independent Forestry Commission of Michigan and defining the duties thereof, as refers to the collection and compilation of matters through the agency of township supervisors be repealed, and that henceforth the commission shall secure through the sources which it deems most reliable, the information contemplated in the act upon which to base further action of the commission or future enactment of the legislature.

2. We recognize the difficulties in the way of discreet legislation, in the hope of diminishing the immense amount of annual loss from forest fires, but after mature deliberation, we deem it desirable that greater security be thrown about innocent parties, through the enactment of a law which shall prohibit the building of fires by persons clearing land during the period from April first to November first in each year, without the consent of the supervisor of the township in writing, with previous notice to owners or occupants of adjoining lands, provided that the law may be suspended by majority vote of the board of supervisors of the county in which such township is situated.

3. We recommend that the commission be authorized to investigate the subject of selecting and acquiring, by the State, of cheap lands in one or more locations, to be set aside and maintained as a preserve, and to report to the governor in its judgment the most feasible methods and the probable expense of securing such lands, with any other information it may deem desirable to communicate in connection therewith.

4. To carry on the work required by the law creating the commission, we recommend that the sum of $1,000 be appropriated for the years 1889 and 1890.

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APPENDIX.

LAWS OF MICHIGAN RELATING TO FORESTS.

TAKEN FROM HOWELL'S ANNOTATED STATUTES.—VOL. 1, '82, CHAP. X.

Shade Trees in Highways.

§1408. SEC. 1. Shade trees shall be planted along both sides of the public highways, at the uniform distance, as near as may be, of sixty feet apart, and not less than twenty-three nor more than twenty-five feet from the center line of the highway, but the township board of any township may direct as to the distance which trees may be set from each other or from the outer line of the highway. All trees now growing upon the sides of any highway, and all trees that may be hereafter planted thereon, standing more than sixty feet apart, shall be preserved and shall not be injured or removed, unless by the direction of the commissioner of highways, and with the consent of the owner of the adjoining land, unless such trees shall interfere with or obstruct the travel on the highway: *Provided*, that the provisions of this chapter in whole or in part shall not be deemed mandatory in townships in which the electors may by vote at a township meeting thus determine.

§1409. SEC. 2. Any person planting trees along the highway adjacent to property owned or occupied by such person, shall be entitled to be credited twenty-five cents upon his highway tax for every tree so planted, but not to exceed in the aggregate twenty-five per cent. of such person's highway tax in any one year.

§1410. SEC. 3. In road districts where there are not trees planted and growing along the highways to the extent required by the first section of this chapter, the commissioner shall require that at least fifty trees per year be so planted in each district, and shall continue to require the same from year to year, until every highway in his township where the adjoining lands are cleared, is supplied with shade trees as contemplated by said first section, but not more than twenty-five per cent. of the highway tax shall be appropriated for such purpose in any one district in any one year. The overseer, acting under the direction of the commissioner, may require twenty-five per cent. of the highway tax of any person in any year, to be paid in money, the same to be applied in planting shade trees along the highway adjoining the property of such person. The overseer shall particularly attend to the planting of such trees, and shall allow no unsuitable tree, nor any tree wanting sufficient roots or vitality to be planted, and he shall have the charge of and the care for the same in the best manner for their growth.

CHAPTER 7, VOL. 1, '82.

Powers of Council.

§2867. SEC. 21. The council may provide for and regulate the planting of shade and ornamental trees in the public highways, streets and avenues of the village, and for the protection thereof. * * * * *

CHAPTER 88.

Planting and Protecting Trees in Villages.

§3065. SEC. 1. *The People of the State of Michigan enact*, That it shall be lawful for the street commissioners of any incorporated village, upon the written application of any six freeholders of such incorporated village, to grant permission to the said freeholders, or any one of them, to plant in any of the public streets, lanes or highways of such village, contiguous to property owned by any of the freeholders making such application, shade or ornamental trees, and to provide suitable protection for and

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around any shade or ornamental trees now growing or hereafter planted within such village: *Provided*, That nothing herein contained shall authorize such street commissioners to grant permission to any person to plant trees in violation of any ordinance of such village.

§3066. SEC. 2. Such permission may be made by such street commissioners, in writing, and may be filed by the party or parties receiving it, in the office of the clerk of such village; and after the said permission shall have been so filed, it shall not be lawful for any person to cut down, mutilate or destroy said trees, so long as they are alive or growing, under the same penalties which would attach to persons guilty of mutilating or destroying trees growing within an enclosure or occupied premises.

§3067. SEC. 3. It shall not be lawful for any person to cut down, mutilate or destroy shade or ornamental trees that have been standing in any highway, public park, street, lane or alley of such village, for the period of five years previous to the passage of this act, so long as said trees are alive or growing, or any shade or ornamental trees which have been heretofore planted, or to cut down, mutilate or destroy the protections placed around any shade or ornamental trees; and any person who shall willfully and maliciously violate the provisions of this act, shall be punished by fine not exceeding twenty-five dollars, or by imprisonment in the county jail not more than sixty days.

Cutting Decayed and Dangerous Trees, p. 884.

§3442. SEC. 1. *The People of the State of Michigan enact*, That any railroad company owning, controlling or operating any line or lines of railroad in this State, be and is hereby authorized and required to cut any tree or trees that are dangerous and are liable to fall or blow over and obstruct the track.

VOL. II. CHAPTER 272, PAGE 1679.

Trespassers on Lands.

§7957. SEC. 1. Every person who shall cut down or carry off any wood, underwood, trees or timber, or shall girdle or otherwise despoil or injure any trees on the land of any other person, without the leave of the owner thereof, or on the lands or commons of any city, township, village or other corporation, without license therefor given, shall be liable to the owner of such land, or to such corporation, in three times the amount of damages which shall be assessed therefor in an action of trespass, by a jury, or by a justice of the peace in the cases provided by law.

CHAPTER 318, PAGE 2215.

Offenses Against Property.

§9129. Any person who shall willfully and maliciously burn or otherwise destroy or injure, any pile or parcel of wood, boards, timber or other lumber, or fence, bars or gate, or any stack of grain, hay or other vegetable product, or any vegetable product severed from the soil and not stacked, or any standing trees, grain, grass or other product of the soil, or the soil itself, of another, shall be punished by imprisonment in the State prison not more than five years, or by fine not exceeding five hundred dollars, or imprisonment in the county jail not more than one year.

Malicious Injury and Destruction of Personal Property.

§9183. SEC. 1. *The People of the State of Michigan enact*, That any person who shall willfully and maliciously drive, or cause to be driven or imbedded, any nail, spike, or piece of iron, steel or other metallic substance into any timber log or bolt which may now be, or may hereafter be put on the banks of or in any of the waters, or any mill-yards of this State, for the purpose of being made into lumber or marketed, shall be guilty of a misdemeanor, and upon conviction thereof, shall be punished by a fine not exceeding one thousand dollars, or by imprisonment in the county jail, not more than one year, or both such fine and imprisonment, in the discretion of the court.

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Protection of Land and Punishment for Cutting and Carrying away Timber therefrom.

§9184. SEC. 1. *The People of the State of Michigan enact*, That every person having no color of title, either tax, equitable or otherwise, who shall willfully and without permission of the owner thereof, enter upon the lands of another, and shall cut down, destroy or remove therefrom any tree, trees, timber, wood, logs or lumber, growing, standing, lying or being thereon, of the value of twenty-five dollars or more, or shall willfully induce, direct, aid or abet any other person in so doing, shall be deemed guilty of a felony, and shall be punished by imprisonment in the State prison not more than one year, or by fine not more than five hundred dollars, and imprisonment in the county jail not more than twelve months.

§9185. Sec. 2. If the tree, trees, timber, wood, logs or lumber so cut down, destroyed, or removed, shall exceed the value of one dollar, and shall not be of the value of twenty-five dollars.

CHAPTER 328.

Firing of Woods and Prairies.

§9402. SEC. 1. Every person who shall willfully or negligently permit any fire to pass from his own woods, prairies, or grounds, to the injury or destruction of the property of any other person, shall be deemed guilty of a misdemeanor and on conviction thereof, shall be punished by a fine not exceeding one thousand dollars, or by imprisonment in the county jail not exceeding one year, or both, in the discretion of the court; and shall also be liable to the party injured in double the amount of damages sustained.

§9403. SEC. 2. Whenever the woods or prairies in any township shall be on fire, so as to endanger property, it shall be the duty of the justices of the peace, the supervisor and the commissioners of highways of such township, and each of them, to order such, and so many of the inhabitants of such township, liable to work on the highways, and residing in the vicinity of the place where such fire shall be, as they shall severally deem necessary, to repair to the place where such fire shall prevail, and there to assist in extinguishing the same or in stopping its progress.

§9404. SEC. 3. If any person shall refuse or willfully neglect to comply with such order, he shall forfeit a sum of not less than five nor more than fifty dollars.

CHAPTER 329, PAGE 2273.

Trespasses on the Public Lands.

§9405. SEC. 1. *The People of the State of Michigan enact*, That every person not thereto lawfully authorized, who shall willfully and knowingly enter upon any of the lands of this State, or any lands held in trust by this State for railroad purposes, or for any purpose whatsoever, and shall cut down or destroy, or cause to be cut down or destroyed, any trees standing or growing thereon, if the value of such trees so cut down or destroyed shall exceed the sum of twenty-five dollars, shall be deemed guilty of felony, and shall be punished by imprisonment at hard labor in the State Prison not more than five years, or by fine not less than one hundred nor more than two thousand dollars.

§9406. SEC. 2. Every person who shall take and carry away any trees or parts thereof, or any timber or lumber made therefrom, so cut or destroyed, or heretofore so cut down or destroyed, on such land, wherever in this State the same shall be, with intent to convert the same to his own use or the use of his employer or principal, if the same shall exceed in value the sum of twenty-five dollars, shall be deemed guilty of a felony, and shall be punished by imprisonment in the State Prison not more than five years, or by a fine not less than one hundred nor more than two thousand dollars, and imprisonment in the State Prison not less than three nor more than twelve months.

§9407. SEC. 3. If the trees so cut down or destroyed, or the trees, parts of trees or timber or lumber made thereof, so taken and carried away, shall not in value exceed the sum of twenty-five dollars, the person offending shall be punished by imprisonment in the State Prison not less than three months nor more than one year, or by fine of not less than fifty nor more than one hundred dollars, and imprisonment in the State Prison not more than three months.

§9408. SEC. 4. In any indictment or information under this act, the person accused may be charged with commencing at some particular time to commit any of the acts

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hereby made punishable, and continuing to commit the same to some other time, which period shall be therein stated, and if the jury shall find the accused guilty, they shall in their verdict state the value of the property so cut down or destroyed, or taken and carried away.

§9405. SEC. 5. All prosecutions under this act may be either by indictment or information in the circuit court for the county in which the offense was committed, or such other county as the same may be removed to, as hereinafter provided, but no such indictment or information shall be filed until the accused party has been held for trial upon a preliminary examination, had within the county where the alleged offense was committed, as in other prosecutions for felony. When any such accused party is held for trial upon any such preliminary examination, the commissioner of the circuit court in which any such prosecution may be pending, may, on the motion of the prosecution made by the prosecuting attorney, attorney general, or commissioner of the State land office, for cause shown, change the venue thereof to any county in this State, and thereby transfer said cause to any county in this State for trial, in all respects the same, and for the same causes that said courts are now authorized to change the venue in criminal cases on motion of the defendant.

§9410. SEC. 6. Any person having knowledge of sufficient facts may make a complaint for commencing a prosecution under this act, the same as in other criminal prosecutions, and the same proceedings shall thereupon be had, and whenever the commissioner of the State land office shall suspect that an offense has been committed against any of the provisions of this chapter, he shall make an affidavit and file the same with any justice of the peace of the county where the offense shall be suspected to have been committed, specifying the offense, and naming the person or persons suspected of having committed the same, and if he shall be unable of his own knowledge to state sufficient facts and circumstances to authorize the issuing of a warrant, such magistrate shall, after the filing of such affidavit, issue subpœnas directed to and compel in the usual manner the attendance of witnesses, who may be required to testify to the best of their knowledge concerning such facts and circumstances, and if it shall appear to such magistrate from such affidavit, or from the examination of such witnesses, as the case may be, that an offense has been committed against any of the provisions of this chapter, he shall issue a warrant directed to the sheriff or any constable of the county, reciting the substance of the accusation, and commanding him forthwith to take the person accused of having committed such offense, and bring him before such magistrate to be dealt with according to law, and the same warrant may require the officer to summons [summon] such witnesses as shall be therein,named. All further proceedings taken in any cause so commenced, shall be according to the practice now or hereafter prescribed by law for the examination of offenses not cognizable by justices of the peace. The legal fees of the magistrate, officers and witnesses necessarily incurred in such examination, other than such costs as may be incurred after such cause shall have been transferred to the circuit or district court, shall be paid by the State treasurer on the warrant of the auditor general, to whom the taxed bill shall be delivered, duly certified to be correct and just by the attorney general or prosecuting attorney of the county.

§9411. SEC. 7. If any person, being the owner of or having any interest in any sawmill, shall, by himself, his agent or servant, use the same in sawing or manufacturing any logs, timber or lumber, so unlawfully cut down or destroyed, taken and carried away, or shall, by himself, his agent or servant, receive the same for the purpose of so sawing or manufacturing the same, at such mill, knowing the same to have been so cut down or destroyed or taken and carried away, he shall be deemed guilty of felony, and shall be punished as first mentioned in this act, and shall be proceeded with in the same manner, and with the same effect in all respects, as if charged with the offense first mentioned in this act. In case the owner, owners or managers of any sawmill used for the purpose of manufacturing timber, thus unlawfully obtained, into lumber, shall be a non-resident or non-residents of this State, the mill or mills, lands and personal property of such non-resident owners, lessees or holders under a mortgage, which property shall be proven to be used or engaged in the unlawful removing of timber from the public or private lands of this State, such property or real estate shall be holden as immediately and directly liable for any and all damages sustained by its unlawful use for purposes aforesaid. Upon proof thereof, the court of competent jurisdiction may forthwith direct the sheriff of the county to take such property or estate into custody, or demand sufficient security therefor, to cause it to abide the decision of the case by due course of law. The damages shall be appraised at not less than double the amount of the market price of the lumber at the mill, which the timber thus unlawfully taken was capable of affording. Upon a rendition of judgment and issue of execution, relating to the property or estate of such non-residents,

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mill owners or parties in interest thereto, the sheriff shall proceed, in default of other payment, to sell the same, or a sufficient portion thereof, to satisfy the execution committed to him, as provided in other cases by law for sales of real or personal estate on execution.

§9412. SEC. 8. It shall be the duty of any attorney having charge of any prosecution under this act, to make diligent inquiry for the party accused, and endeavor to cause him to be arrested and tried without unnecessary delay; and whenever he shall be satisfied that the accused is not within the State, but is liable to be demanded by the governor of this State as a fugitive from justice, he shall report the fact to the governor, and transmit to him a copy of the indictment, or of the information and affidavit, duly authenticated under the seal of the court, in order that the governor may demand such fugitive as provided in any act of congress.

§9413. SEC. 9. All fees and costs accruing under this act, after being duly taxed as required in other criminal cases in the circuit or district court, and certified to be correct and just by the judge thereof, shall be paid by the State treasurer on the warrant of the auditor general, to whom the taxed bill shall be delivered, out of the primary school fund, when the offense prosecuted shall relate to primary school lands, and out of the proceeds of the sales of the swamp lands, when it relates to said lands; and all fines collected under this act shall be paid to said State treasurer and treated as a part of the primary school fund or the swamp land fund, as the case may be. And whenever the attorney prosecuting the offense shall make and forward an affidavit to the auditor general naming any particular person as the informer, by whose diligence the accused was detected and convicted, the auditor general shall on the application of such person, his executor or administrator, draw his warrant on the State treasurer in favor of such person for one-half the amount of the fine collected in the case where he was such informer, which warrant shall be paid by said treasurer out of the moneys collected for such fine.

§9414. SEC. 10. This act shall not be construed to affect any offense or trespass already committed on or concerning any such lands, nor the right of the State to prosecute or sue for the same; but such prosecutions or suits may be instituted and shall proceed and have the same effect as if this act had not been passed.

PUBLIC ACTS, 1885 [NO. 90], PAGE 92.

AN ACT to amend section seven thousand six hundred and twelve of compiled laws of eighteen hundred and seventy-one, being section nine thousand one hundred and eighty-four of Howell's Annotated Statutes relative to the protection of land and punishment for cutting and carrying away timber therefrom.

SECTION 1. *The People of the State of Michigan enact*, That section seven thousand six hundred and twelve of the compiled laws of eighteen hundred and seventy-one, being section nine thousand one hundred and eighty-four of Howell's Annotated Statutes relative to the protection of land, and punishment for cutting and carrying away timber therefrom, be and the same is hereby amended so as to read as follows:

(7612.) SECTION 1. Every person having no color of title, either tax, equitable or otherwise, who shall willfully and without permission of the owner thereof, enter upon the lands of another and shall cut down, destroy, or remove therefrom any tree, trees, timber, wood, logs, or lumber, growing, standing, lying, or being thereon, of the value of twenty-five dollars or more, or shall willfully induce, direct, aid or abet any other person in so doing, and every person who shall knowingly receive into his possession, or permit to be stored in or upon any premises, mill yard, or boom, in his possession, or shall purchase or shall manufacture or cause to be manufactured into lumber, shingles, lath, or other products, any trees, timber, wood, or logs so cut down or removed, knowing the same to have been cut or removed without permission of the owner, with intent to induce, profit, aid, or abet any other person in such cutting down or removal, or to profit himself thereby, shall be deemed guilty of a felony, and shall be punished by imprisonment in State prison, not more than one year, or by fine of not more than five hundred dollars or imprisonment in the county jail not more than twelve months.

Approved May 11, 1885.

PUBLIC ACTS, 1885 [NO. 142], PAGE 158.

AN ACT to amend section ten of act number two hundred and thirty-eight of the session laws of eighteen hundred and seventy-nine, being an act entitled "An act to protect logs, lumber, and timber, while floating upon the waters in this State, or lying

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upon the banks or shores thereof," being compiler's section two thousand and fifty-eight, Howell's Annotated Statutes of the State of Michigan.

SE TION 1. *The People of the State of Michigan enact,* That section ten of act number two hundred and thirty eight of the session laws of eighteen hundred and seventy-nine, being an act entitled "An act to protect logs, lumber, and timber while floating upon the waters in this State, or lying upon the banks or shores thereof," being compiler's section two thousand and fifty-eight, Howell's Annotated Statutes of eighteen hundred and eighty-two, be amended so as to read as follows:

SEC. 10. Whenever any logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, in rafts or otherwise, shall be drifted or float upon any island in any of the waters or streams in this State, or upon the banks or shores of such waters or lands adjacent thereto, the owner of such logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, or any person or corporation entitled to the possession thereof, may at any time within eighteen months remove the same upon paying or tendering to the owner or occupant of such bank, shore, or lands, such reasonable damages as may have been caused by such occupancy and removal, but if the amount of such damages cannot be agreed upon by the owner or occupant of such bank, shore, or land, and such owner, person, or corporation entitled to such logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, either of them may elect to have the amount of said damages left to arbitration in the manner following: The party or parties so electing, or their authorized agent or attorney, shall serve a written notice by mail or otherwise, upon such other party or parties, reciting the fact that they elect to have such damages left to arbitration, and that they will meet such persons, their agents or attorneys, at the office of some one of the justices of the peace of the township, where such island, banks, shore or land is situated, at a time in said notice mentioned, not less than six days nor more than twenty days from the time of the service of said notice, at which time and place, such parties or their authorized agents or attorneys shall meet to choose such arbitrators as aforesaid, in the manner following: The party giving notice, or his, her, or their authorized agent or attorney shall select one person to act as one of said arbitrators, and the party so notified, his, her, or their authorized agent or attorney, shall choose another, and these two thus chosen shall select a third: *Provided,* That all persons chosen under the provisions of this act shall be chosen from among the freeholders residing in the township or an adjoining township where such island, bank, shore or land is situated. And if said parties, his, her, or their authorized agents or attorneys, cannot agree upon the selection of said persons as arbitrators, then either or any of such parties may certify such fact or facts, to one of the justices of the peace of such township as aforesaid, who shall upon the receipt of such certificate proceed at once to make a list of the names of eighteen freeholders who shall be, either residents of such township, or of such township and adjoining townships, and the parties aforesaid shall strike out, alternately, the plaintiff first striking out, one name from the said list, until only three names remain, and the freeholders whose names so remain upon the list shall act as such arbitraters. Said justice of the peace shall notify said persons so selected, who shall appear before such justice at a day set by him, at a time not less than three nor more than ten days from the service of said notice. At such time so set for the meeting of said arbitrators, they shall appear and be sworn or affirmed to justly and equitably try all matters in relation to such damages and shall proceed to hear testimony and decide the amount of said damages. The said arbitrators shall have the right to view the said island, bank, shore, or land, the occupancy of which is in controversy. The said arbitrators shall have all the powers usual to arbitrators. When the said arbitrators shall have determined the amount of damages, they shall, if chosen by the interested parties as first provided in this section, certify the same to one of the justices of the peace in the township where the said island, bank, shore, or land is situated, who shall thereupon enter a judgment in his docket for such award against such owner, person, or corporation entitled to such logs, timber, boards, planks, or floatables, and execution shall issue thereon as in other cases in justices' courts. But if the arbitrators shall have been designated from any list of names as provided in this section, they shall certify the amount of damages to the justice of the peace making such list, and he shall in like manner enter judgment, and execution shall issue thereon the same as in other cases in justices' courts. Should either party complain of such award, such party may appeal to the circuit court of the county where such island, bank, shore or land is situated, by giving bonds for the amount of such award and costs, but such appeal shall not be allowed except for reasons as set forth in sections nine and ten, chapter two hundred and ninety-two of Howell's Annotated Statutes. If such logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, shall not be removed within said eighteen months under the provisions

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of this section, the owner thereof shall be deemed to have forfeited all right thereto, and such owner or occupant of said lands may make out a sworn statement containing a description of the lands on which said logs, timber, boards, planks or floatables are lying, the number of logs, and the amount of timber, boards, plank, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts as nearly as may be, and the marks thereon, if any, and the length of time the same have remained on said land, and upon delivering such statement to any sheriff, deputy sheriff, or constable, such officer shall proceed and make sale of such logs, timber, boards, plank, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, at public auction, at some convenient and public place in the vicinity thereof. Immediately on making such sale, such officer shall pay over to the owner or occupant of such lands the proceeds of such sale less his fees for making the same, which fees shall be the same as upon levy and sale upon execution: *Provided*, That no sale shall be made without giving ten days' notice to the owner of such logs if known; and if not known, then such officer shall give like notice as he would be required to give on sale of personal property on execution, and when such sale shall have been made he shall thereupon make his certificate, stating the time and place of sale, the number or amount of logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts sold and the marks thereon, if any, and the name of the purchaser or purchasers, the amount paid and the disposition of the same. He shall at once annex such sworn statement to said certificate, and file the same in the office of the county clerk of the county in which the sale was made: *Provided further*, That when the property mentioned in section one of this act, shall be or lie upon any improved farming lands of this State, adjoining any of the waters mentioned in said section one, if the owner or occupant of such lands shall make the affidavit hereinbefore required, and shall cause a copy of said affidavit to be personally served on the owner or agent of the owner of the property mentioned in said affidavit, if said agent or owner be known to the owner or occupant of said lands, but if not known to said owner or occupant then he shall cause a copy of said affidavit to be published in one or more newspapers in said county in which said land is situated, for three successive weeks if there be one, but if not, in one of an adjoining county, and a copy of the same shall be sent to the office of the booming or log-running company having such property in charge or doing business on such streams if known by said owner or occupant, said notice to be sent by mail or otherwise, which said notice shall require said owner or agent to remove said property mentioned in the said affidavit, within thirty days after the receipt of said notice. If said owner shall neglect or refuse to remove the said property, and pay all reasonable damages and charges thereon, then said owner or occupant may remove the same to the adjoining stream or to the banks thereof, and if the same is not claimed by the owner thereof within six months thereafter, and all reasonable charges and damages are not paid, the owner or occupant of said land is empowered to sell the same at public auction to the highest bidder by giving the same notice as required by law in sales of personal property by sheriffs and constables; said sale to be conducted as hereinbefore provided for the sale of logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, having lain for eighteen months upon such land, and the proceeds applied in the same way as provided in case of the sale of such logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts: *And provided further*, That all reasonable damages and expenses incurred and suffered by the owner or occupant of such lands shall be a lien upon such logs, timber, boards, planks, spars, boomsticks, spiles, shingle bolts, railroad ties, or fence posts, until paid.

Approved June 5, 1885.

PUBLIC ACTS [No. 153] PAGE 198.

AN ACT to provide for the assessment of property, and the levy and collection of taxes thereon.

SEC. 76. It shall be unlawful for any person to cut or remove any logs, wood, or timber from any lands sold and bid in by the State of Michigan for the non-payment of taxes, while such taxes remain unpaid and the State remains the owner of such lands by virtue of such sale, and if any person shall cut or remove such logs, wood or timber from such lands during the time aforesaid, the auditor general or his deputy shall issue a warrant under his hand, in the name of the People of the State of Michigan, directed to the sheriff of the county where such lands are situated, giving therein a description of such lands, the amount of such taxes, with interest and charges thereon then remaining unpaid, commanding such sheriff forthwith to seize such logs, wood or timber wherever the same may be found in any county in this State, and to sell the same or a suf-

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ficient quantity thereof to satisfy such taxes with the interest and charges thereon and the costs of such seizure and sale. The sheriff shall receive such warrant and execute the same, as therein directed, as in case of levy and sale on execution, and make return thereof with his doings thereon to the auditor general, within sixty days after the receipt of the same and pay over all money collected thereon to the State treasurer. The auditor general shall furnish the State trespass agent with lists or plats of land bid in by the State, and remaining unpaid, and the said trespass agent shall examine such lands and promptly report to the auditor general all violations of the provisions of this section.

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